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Development of Semiconductor Physics and Chemistry in Moldavian SSR

Kishinev IZVESTIYA AKADEMII NAUK MOLDAVSKOY SSR: SERIYA FIZIKO-TEKHNICHESKIKH I MATEMATICHESKIKH NAUK in Russian
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[Article by S.I. Radautsan, O.G. Maksimova and K.G. Nikiforov]

[Text]The article is dedicated to the 25th anniversary of the formation of the Moldavian SSR Academy of Sciences and summarizes the results of development of semiconductor physics and chemistry in the republic. In the new version of the CPSU Program, the modern needs of our society in regard to science are formulated. Among the most important conditions, the need is pointed out here of concentrating personnel and resources on the most promising directions and on the quickest possible realization of scientific ideas and increased effectiveness of applied research and cooperation of academic, VUZ and sectoral science.

Semiconductor research in Moldavia began in 1953 at Kishinev State University, and since 1959 work in this direction has been done at the Moldavian affiliate of the USSR Academy of Sciences. Concurrently with the organization of the republic Academy of Sciences in 1961, the Institute of Physics and Mathematics was created in Kishinev. It included two laboratories of the semiconductor type—semiconductor compounds and low-temperature optics. Later on, the Institute of Applied Physics was organized at this institute. It became the leading establishment for physics research in the republic. It now has in operation in addition to the two mentioned above laboratories dealing with semimetal physics, photoelectric properties of semiconductors, physical kinetics, low-temperature physics and laser research doing work in the field of semiconductor physics and chemistry. Research in this direction is widely conducted at Kishinev State University at the departments of semiconductor physics, optics and spectroscopy, and elec ronics and in problem laboratories of semiconductor physics and photothermoplastic recording.

In 1954 at the Department of Electrophysics of Kishinev State University, the first graduation of specialists in semiconductor physics took place. In 1964, the Kishinev Polytechnic Institute was organized. Here training of engineers in electronic technology of the semiconductor type began and at the same time scientific-research work developed in the field of physics of semiconductor devices. Today research on semiconductors is being actively pursued at the Kishinev Polytechnic Institute at the departments of physics and semiconductor and microelectronic devices and at the sectoral scientific-research microelectronics laboratory.

For the purpose of speeding up processes of practical use of the results of scientific research, specialized design and technological bureaus of solid-state electronics (attached to the Institute of Applied Physics of the MSSR Academy of Sciences, 1976) and the problem laboratory of photothermoplastic recording (attached to Kishinev State University, 1976) were created and are operating successfully.

Certain work in the field of semiconductor research is also going on at the Department of General Physics of Tiraspol Pedagogic Institute and at the Moldavian division of the All-Union Scientific-Research Institute of Current Sources.

The training of highly qualified specialists is constantly going on by means of postgraduate training at the Institute of Applied Physics, Kishinev State University and Kishinev Pedagogic Institute. Training is widely pursued through special graduate studies at leading scientific centers. Specialized councils for defense of candidates' dissertations operate at the Institute of Applied Physics of the MSSR Academy of Sciences and Kishinev State University. In 1981, a doctoral council for the specialty "Physics of Semiconductors and Dielectrics" was instituted.

In 1977, the republic scientific council on the problem "Physics and Chemistry of Semiconductors" was organized for coordination of experimental research in the field of semiconductors and concentration of efforts of scientists on the most important and promising directions.

It should be noted that from the initial years of development of semiconductor physics and chemistry in Moldavia, the leading Soviet scientists in this field—Academicians Zh.I. Alferov, B.M. Vul, A.V. Novoselova, A.M. Prokhorov, V.M. Tuchkevich, Professors N.A. Goryunova, B.T. Kolomiyets, D.N. Nasledov, A.R. Regel and others—devoted much attention to organizing and carrying out promising research.

At the present time, eight scientific and scientific-production institutions in which a large detachment of scientists and specialists—3 academicians and 2 corresponding members of the MSSR Academy of Sciences, 15 doctors and more than 130 candidates of sciences—are engaged in the work.

In the past 10 years, work on semiconductor physics and chemistry has attained a special momentum. During 1976-1985, the research results of the scientists were generalized in 60 monographs and thematic collections, presented in 2,000 scientific articles and protected by 350 author's certificates for inventions in the USSR and 20 patents in foreign countries. Much of the work was done on orders of sectoral scientific-research institutes and industrial enterprises, and the results of 150 of these studies were introduced into the economy.

In these years, a number of major scientific forums were held in Moldavia, including the International Conference "Amorphous Semiconductors-80," the all-union conferences "Ternary Semiconductors and Their Application" (1976, 1979, 1983), "Further Development of Optoelectronics" (1977), "Physical Bases of Degradation and Reliability of Semiconductor Instruments (1982, 1986), "Indium Phosphide in Semiconductor Electronics" (1985) and the All-Union School for Topical Questions of Semimetal Physics and Narrow-Zone Semiconductors (1981).

During the 1976-1985 period, 7 doctoral and more than 100 candidate dissertations were completed and successfully defended on the basis of the work coordinated by the council.

A.N. Andriyesh, E.K. Arushanov, M.V. Kot (posthumously), I.P. Molodyan, V.P. Mushinskiy, S.I. Radautsan, E.V. Russu, A.V. Simashkevich, V.V. Sobolev, A.Ye. Tsurkan, F.S. Shishiyanu, S.D. Shutov were awarded the Moldavian SSR State Prize in the Field of Science and Technology for 1983 for production, comprehensive research and employment of crystal and amorphous binary semiconductors.

Institute of Applied Physics of the MSSR Academy of Sciences

At the laboratory for semiconductor compounds, work is going on under the supervision of Academician of the MSSR Academy of Sciences S.I. Radautsan on the production and comprehensive investigation of binary and ternary semiconductors.

A semicommercial technology was developed of growing undoped and doped indium phosphide with a broad assortment of parameters in the form of both single crystals and epitaxial layers. Specimens were produced with specific resistivity gr equivalent to 10^6-10^8 Omxcm and mobility gm=(1-2.3x10^3 cm^2/(vxs) at 300 K suitable for use as a material for the creation of devicestructures and active elements of circuits operating at heightened speed.

Single crystals of cadmium phosphide and arsenide with a broad collection of electron concentrations were grown by means of growth methods from a vapor phase in a vacuum and in an atmosphere of inert gas. On cadmium arsenide, a record mobility of carriers of a charge of 26,4000 cm^2/vxs at 300 K was obtained for semiconductor compounds of that type. On the basis of comprehensive research of the influence of temperature, pressure and strong magnetic fields on kinetic effects in cadmium phosphide and arsenide, the parameters of their energy zone structure were determined. For the first time there was found a narrowing of the band of spontaneous luminescence and a discrete retuning of its frequency within the limits of 2.12-2.17 micrometers with an increase in the degree of its doping by copper, which is promising for the creation of effective sources of coherent infrared radiation.

A laboratory technology was developed of growing single crystals of zinc telluride homogeneous in composition doped by admixtures of the first (Li, Na, K; Cs) and the second (Be, Mg, Cd, Hg) groups of L.I. Mendeleyev's Table of Elements. In crystals doped with lithium, there was discovered the effect of brightening the spectrum in the green region through excitation with laser pulses and nonlinear phototropic filters for recording dynamic holograms as well as light shutters for producing laser pulses of the subnanosecond range.

Epitaxial growing produced heterojunctions between compounds $A^{II}B^{VI}$ and $A^{III}B^{V}$, $A^{II}B^{VI}$ and $A^{II}B^{VI}$, $A^{II}B^{VI}$ and silicon in a quasi-enclosed space. On the tin dioxide-cadmium selenide-zinc telluride thin-film structure, an effect was displayed of switching with remembering, which is promising for the creation of fast counting boosters. It was noted that heterostructures formed by compounds $A^{II}B^{VI}$ and silicon possess heightened photosensitivity due to a big difference in the values of specific resistance and breadth of the forbidden zone of the components forming the junction. On zinc telluride—zinc oxide structures, an injection electroluminscence was found for the first time in the blue region of the spectrum. The possibility was shown of creating on the basis of heterojunctions (cadmium telluride-zinc telluride/indium antimonide (arsenide) solid solutions of analogues of metal-dielectric-semiconductor structures with a low density of surface states at the boundary of the division [razdel] (N_{ss} equivalent to 10^{10} cm^{-2} ev^{-1}). On the zinc telluride-indium phosphide structures, an electroluminescent radiation was detected in the green region of the spectrum due to the recombination of charge carriers injected from indium phosphide, and an effect was also established of switching with memory.

The method of chemical transport reactions produced single crystals of ternary zinc and cadmium sulfides of the type $A^{II}B^{III}{}_2C^{VI}{}_4$. In the ZnS-In_2S_3 system the existence was established of ternary semiconductor phases $Zn_mIn_2S_{3+m}$, m = 1,2,3, in which the phenomenon of polytypism [politipizm] was revealed, which is promising for the creation of superlattices on their basis.

X-ray conductivity of cadmium thiogallate was shown. This made it possible to utilize it as an ionizing radiation detector. Comprehensive research was conducted on the optical and photoelectrical properties of the produced materials, which showed their high photosensitivity in the ultraviolate region of the spectrum and a big resistivity to the dark. On the basis of cadmium thiogallate, small-size light detectors were developed and created for the near ultraviolet region of the spectrum used in microelectronic devices for detection of ultraviolet radiation, which were successfully tested and introduced in different fields of science and the national economy.

By methods of chemical transport reactions, single crystals of magnetic semiconductors $CdCr_2Se_4$, possessing a low density of dislocations (10^2 cm^{-2}) with record narrow lines of ferromagnetic resonance (1.6-2.1 E) were produced from the solution in a molten state. The region of occurrence was determined of ferromagnetic spinels among the compounds formed by anion substitution of copper selenochromite. The influence of doping on the microhardness and density of dislocations in cadmium selenochromite was studied. The possibility was found of control by sign and quantity of conductivity of strongly compensated crystals of such compounds by means of special thermal treatment. For the first time, the coexistence of chromium ions of reduced and increased valence (Cr^{2+} and Cr^{4+}) was found for compounds of this class in cadmium sulfochromite, and conditions were determined of combining semiconductor properties and high (above room) temperature of the magnetic phase transition in the copper selenochromite with anion substitution for bromium. In cadium sulfochromite and selenochromite single crystals, magnetic dependent effects of switching were determined and mechanisms of their occurrence and conditions of combination with magnetic phase transition were studied. The influence of superhigh frequency conductivity on processes of ferromagnetic relaxation in mercury selenochromite and solid solutions on the basis of copper selenochromite was disclosed.

$SnMo_6S_8$ single crystals were produced with the method of gas transport reactions in a gallium atmosphere. Values were determined of the basic electrophysical parameters: the temperature of transition into a superconductive state (T_c=11.5-11.8 K), relative resistivity ($gr_{300\ K}$=2.4-2.6x10^{-4}Om x cm), the gradient of temperature dependence of the upper critical field Nc_2/dT=45.9-47.7 kE/K). Specimens were obtained of ternary molybdenum chalcogenides $PbMo_6S_8$ and $SnMo_6S_8$ in the form of coats on the surface of the molybdenum wire and tape [lenta] with the values of a superconductive transition (T_c=14.8 K for $PbMo_6S_8$ and 14.3 K for $SnMo_6S_8$), the biggest for comparable specimens according to the literature data.

In 1980, a group of young scientists from the laboratory was singled out for the Prize of Komsomol of Moldavia imeni B. Glavan for a series of works on the production, comprehensive investigation and employment of magnetic semiconductor compounds and in 1985, it was awarded the Challenge Red Banner of the Komsomol Central Committee and inscribed in the Golden Book of Honor of the Komsomol Central Committee.

The department of physics of semimetals and low temperatures under the supervision of Academician of the MSSR Academy of Sciences D.V. Gitsu is engaged in the development of investigations of solids at low and extra low temperatures and the development of highly sensitive devices.

A phenomenological and microscopic theory was developed of phenomena of transport in semimetals of the bismuth type in the case of classical magnetic fields.

Systematic research was conducted of anisotropy of kinetic effects in semimetals of the group and their alloys at various temperatures in stationary (up to 18 Tl) and pulsed (up to 40 Tl) magnetic fields. The energy spectrum was studied in details of bismuth-antimony and anitimony-arsenic alloys with the help of quantum oscillation effects. "Gigantic" in amplitude quantum oscillations of magnetothermoelectric motive forces and the areas of observation of this effect were established as to temperature, magnetic field and concentration of components in alloys of semimetals. The special features were studied of anisotropy phenomena of transport in bismusth-antimony alloys in phase electron transitions semiconductor-semimetal in ultraquantum magnetic fields.

A method was developed of studying the behavior of nonisoelectron impurities in weakly degenerated systems, and the existence was shown of small-radius states for which the mechanism of contact with zone states significantly utilizes local disturbances of the symmetry of the introduced impurity. It was established that the character of behavior of the effectiveness of impurities on the degree of doping and temperature in semimetals differs from that in semiconductors.

A theory was developed of the electron energy spectrum of complex narrow-zone semiconductors $A^{III}B^{V}C^{VI}_2$ and hard solutions on their basis. A new group of solid solutions was predicted whose energy spectrum would be characterized by transfer through a slitless condition, the phenomenon of binary inversion of the zone spectrum and the existence of a semimetal two-dimensional state in inverse contacts on the basis of $TlBi_xSb_xC^{VI}_2$.

Single crystals of compounds of the type $TlB^{V}C^{VI}_2$ were produced by the method of zone recrystallization. Phase interactions were studied and diagrams were constructed of the condition of alloys of sections $TlSbSe_2$-lead selenide and $TlBiTe_2$-lead telluride. Galvano- and thermomagnetic characteristics of the $TlB^{V}C^{VI}_2$ group were studied and the basic parameters of the charge carriers were determined. On the basis of $TlSbSe_2$ crystals, a quick-response photoresistor of the visible range for recording pulse laser radiation in the region of the spectrum of 400-700 nm with a depletion time of not more than 10^{-8} sec.

On the basis of the low-temperature thermoelectric materials—bismuth and antimony chalcogenides, micro coolers were developed intended for cooling and thermostating objects in a broad range of temperature (from +60 to -50 degrees centigrade).

Th Ulitovskiy continuous casting method produced thin (a diameter of up to 0.1 micrometer) threads of semimetals and narrow-zone semiconductors. The possibility was shown of increasing the degree of homogeneity of the threads of bismuth-antimony alloys by multiple zone recrystallization.

The dependence of kinetic coefficients on the diameter of the vein in the thinnest possible threads was found, when the thickness of a specimen becomes comparable to the length of a free run of charge carriers (the size effect). A number of size quantum effects were discovered on the thin threads, including new types of resistivity oscillations in a magnetic field, fading with its growth. Direct observation was carried out of the effect of increasing electrons and holes of nonequilibrium phonons in the compensated material. Strong nonlinearities were disclosed caused by the "cherenkovskiy" generation of phonons.

A heating analogue was observed of Josephson's effect, accompanied by superlow frequency generation of electromagnetic radiation, and on its basis a low-temperature radio-engineering device was proposed. Superconducting detectors of infrared radiation were created.

A model of the unit was developed and made on the basis of a gigawatt frequency modified picosecond laser intended for the excitation and recording of spatial [obyemnyy) biofluorescence in the spectral range of 1.06-0.25 micrometers.

Fast-response thermoelectric transformers were fabricated for measuring gas pressure and for nonselective recording of radiation. There were developed a design of a temperature gauge whose sensing element was produced on the basis of an antimony microwire, a gauge for recording atomic oxygen and ozone and others. Parameters of thermoelectric devices of different types were calculated and optimized in the range of temperatures of 4.2-300 K.

In 1982, a group of young scientists from the laboratory was awarded the Prize of Komsomol of Moldavia imeni B. Glavan for work on the study of electron phenomena at low temperatures.

In the low-temperature optics laboratory, the optical properties of solid bodies (semiconductors, dielectrics, semimetals, crystals and glass) are being investigated in a broad energy range from 1 to 10 electronvolts under the supervision of Professor V.V. Sobolev.

For the first time, precision spectra were studied of reflection of single crystals of the groups A^{IV}, $A^{III}B^{V}$, $A^{II}B^{VI}$, $A^{IV}B^{VI}$, $A^{III}B^{VI}$, $A^{II}B^{V}$, $A^{III}{}_2B^{VI}{}_3$, $A^{II}B^{IV}C^{V}{}_2$ and SbSI. Measurements were performed on the orginal automatic units with recording reproducibility of the coefficient of reflection (about 0.03 percent), exceeding by approximately one order of magnitude of the reproducibility of known comparable units in the country and abroad. The precision of measurements made it possible to disclose a significantly more complex structure of reflection spectra than was known; as a rule instead of 5-7 spikes, two- to threefold more were established. The employment of the high resolving spectral capacity of the units made it possible to determine the polarizatioin and energy of parts of spectra and the complex thin structure of excitons and exciton-extrinsic complexes.

On the basis of precision reflection spectra, reflections and correlations of Kramers-Kronig full complexes of optical basic functions were computed in a broad area of energy and in polarized light for 80 and 295 K: the dielectric function, indicators of absorption and refraction, the function of characteristic losses of electrons, the effective number of valent electrons participating in transitions, electrooptical differential functionss and others.

Experimental and reference spectra contain the fullest and most accurate information on the special features of intrinsic interzone and exciton transitions of emitted compounds in a broad area of fundnamental absorption.

The obtained results provide a reliable basis for developing a theory of zones and excitons of many isotropic and very anisotropic binary and ternary compounds, determining many parameters of instruments and devices on their basis, developing precision noncontact fast methods of quality determination, their perfection and the composition of solid solutions on their basis.

In the laboratory of photoelectric properties of semiconductors, chalcogenide glassy semiconductors are being studied under the supervision of Academician of the MSSR Academy of Sciences A.M. Andriyesh.

The existence in the forbidden zone was disclosed of glassy arsenic sulfide of several groups of local conditions with quasicontinuous distribution on the basis of energies, causing a strong dispersion of charge transfer.

The basic features of electrophysical and optical properties of alloys in arsenic sulfide-antimony sulfide and arsenic sulfide--germanium systems were determined. The possibility was shown of changing the energy distribution of localized states by means of a variation in glass composition. Intermediate compositions of the said systems are characterized by higher photosensitivity and thermal stability compared to arsenic sulfide, which is promising for the creation of recording mediums of optical information on the basis of charge accumulation.

Heterojunctions were obtained on the basis of silicon and glassy materials of the arsenic sulfide-germanium system as well as a number of retrostructures possessing the effect of injection sensitization of the transport layer from the chalcogenide glassy semiconductor for use in recording systems of optical information. A sharp increase in the mobility of charge carriers was observed

with injection through the silicon-arsenic sulfide heterojunction or in light injection through a change in the degree of filling traps within the forbidden zone of nonequilibrium carriers.

Planar and drawn fiber light guides of chalcogenide glassy materials were produced and their waveguide characteristics were investigated. The possibility was shown of controlling the optical properties of the waveguide by the employment of light refraction. A light induced change in the radial profile of the refraction indicator in the fiber was obtained. The effect of light induced optical absorption in fibers in the region of tranparency was disclosed and studied. The indicated phenomena were recommended for the creation of different functional elements for devices of laser communication lines.

On the basis of chalcogenide glassy semiconductors, gauges were developed that are being used in agrobiological research, for measuring humidity, intensity of photosynthetically active radiation as well as a microphotoresistor and a photocell for the measurement of the leaf area of plants.

In the laser research laboratory, work was conducted under the supervision of Doctor of Physico-Mathematical Sciences S.L. Pyshkin on investigation of luminescence of semiconductors as well as laser technology for producing various types of microelectronic devices.

Competing multiquantum junctions in semiconductors, phase transitions in the system of bound excitons and biexcitons of high density were found and studied. A series of works was done on the technology of synthesis and production of single crystals of gallium phosphide.

An analyzer of fast flowing processes was developed and made. It was used in research and optimization of erosion laser plasma from semiconductor targets.

The Republic's VUZ's

At the department and the laboratory of semiconductor physics of Kishinev State University imeni V.I. Lenin, they are engaged under the supervision of Professor A.V. Simashkevich in the production of and research on single crystals and thin layers of compounds of group $A^{II}B^{VI}$ and hard solutions as well as heterostructures on the basis of these compounds.

Comprehensive research was conducted on electron and radiation processes in single crystals and n-ZnSe thin layers in a broad range of temperatures (16-300 K) and magnetic fields (up to 46 kE).

Mechanisms of conductivity relative to impurities were studied. It was shown that in moderately doped crystals n-ZnSe (N_D greater than or equal to $3x10^{3x10^{16}}$ cm^{-3} the wave functions of extrinsic atoms, overlapping, form the extrinsic zone. With growth of N_D, the extrinsic zone, remaining relatively narrow, draws nearer to the conductivity zone and when N_D is greater than $5x10^{17}$ cm^{-3} merges with it. When N_D is greater than 10^{16} cm^{-3}, overlapping of the wave functions with extrinsic states becomes exponentially small. Conductivity for impurities occurs through a tunnel crossing of electrons from one donor to another, that is, it is of a jumping character.

A detailed investigation was carried out of the mechanisms of electron scattering in N-ZnSe. The influence of concentration of electrons and the of degree of compensation on the mobility of carriers of the current was studied. It was shown that the presence of a casual extrinsic [primesnyy] potential in strongly doped compensated crystals (SLK) results in a sharp reduction of mobility due to the special features of conductivity in such a system.

In a broad range of temperatures (4.2-300 K), spectral photoluminescence (FL) and cathode luminescence (KL) of crystals and layers of n-ZnSe were studied. The nature of high-temperature blue cathode luminescence of n-ZnSe was determined. It was shown that the fundamental mechanism of cathode luminescence in this is a recombinatioin of excitons bound to ionized small donors.

A technology was developed of growing undoped and doped $PbSn_xTe_{i-x}$ crystals with methods of zone recrystallization and zone sublimation, making it possible to produce single crystals with given parameters. The galvanomagnetic, thermomagnetic and photoelectric properties of the grown crystals were investigated. An experimental law of dispersion was established, and the effect of [" (?)] phonon entrainment of charge carriers," "mirroring" ["zerkalizatsiya" of energy spectra of the conductivity zone and the valent zone was revealed. It was shown that with T greater than 20 K, $Pb_{0.75}Sn_{0.25}Te$:In crystals possess high photosensitivity and long lasting relaxation.

Thin-film (of the layer-layer type) heterojunctions zinc telluride-cadmium selenide and zinc selenide and a solid solution between zinc and cadmium tellurides were produced and studied. It was shown that in all the obtained heterojunctions the p-n junction coincides with the phase boundary of the division.

The possibility was found of controlling spectral parameters of heterojunctions for $A^{II}B^{VI}$ by changing the thickness of the components, the degree of their doping, illumination and so forth. Selection of optimal conditions makes it possible to create heterojunctions with equal sensitivity throughout the entire area of the spectrum enclosed between the energies corresponding to the breadths of the forbidden zones of the components.

Together with personnel of the physical kinetics laboratory of the Institute of Applied Physics of the MSSR Academy of Sciences, the possibility was shown for the

first time of pulse control of electric parameters of heterostructures with the help of optical quantum generators (through narrowing of the p-n junction for the time of laser pulse operation).

Injection electric luminescence at the formed compounds of $A^{II}B^{VI}$ heterojunctions was disclosed. On this basis, light-emitting diodes were created for different areas of the visible spectrum: red, yellow, green and blue. The promising character proved of using heterojunctions on the basis of $A^{II}B^{VI}$ as cells of solar batteries, that, is direct transformers of solar into electric energy (efficiency of up to 7 percent).

It was demonstrated that heterojunctions zinc telluride-cadmium selenide and zinc telluride-zinc selenide could be used both as a source of light and as photodetectors, that is, they form an optoelectric couple. The presence of coordinated spectral characteristics in fabrication of the light source and detector from one and the same semiconductor material is promising in the sphere of use for optoelectronics and integrated optics.

On the basis of heterojunctions with a nonhomogeneously doped component, optolectronic memory cells were created. They are characterized by the property of additivity and the possibility of recording, storing and erasing data without the use of external voltage [vneshnoye napryazheniye].

The department of optics and spectroscopy of Kishinev State University under the supervision of Professor V.P. Mushinskiy is engaged in research on optical and photoelectrical properties of semiconductors, primarily binary and ternary gallium and indium chalcogenides.

Anisotropy of electrical conductivity in layer crystals [sloistyye kristally] of gallium and indium monochalcogenides was studied. For gallium sulfide, selenide and telluride, conductivities in reciprocally perpendicular crystallographic directions differ on the order of 2,000, 400 and 20 times. The dependence of the parameter of anisotropy on concentration of the impurity was determined and its reduction was shown with temperature growth.

A phenomenon of optical orientation of free excitons in certain layer crystals of the gallium-monoselenide type was discovered. The influence of exciton states on the luminescent characteristics of such compounds and their solid solutions was shown.

Compounds of the type $A^{III}B_2$—gallium and indium sesquichalcogenides—were studied in detail. The significant influence of intrinsic defects of such compounds on their basic physical properties through spreading of the edges of the energy zones was demonstrated. The possibility was proved of the existence of excitons in semiconductors with stoichiometric vacancies. The nonsensitivity of such materials to x-ray radiation was disclosed, which is promising for the creation on their basis of radiation detectors operating without degradation under conditions of increased radiation.

Spectral and temporal characteristics of the longitudinal photocurrent of crystals and thin layers of gallium sesquiselenide and sesquisulfide, cadmium thiogallate and cadmium selenogallate as well as structures of the the type of MSM [metal-semiconductor-metal), MSDM [metal-semiconductor-dielectric-metal] and MDSDM (metal-dielectric-semiconductor-dielectric-metal were studied. It was shown that thin layers and single crystals of the said gallium halcogenides could be used as photosensitive cells of image converters. Laboratory models of operating converters were made and their parameters were determined. The converters are distinguished from known ones by a broader field of spectral sensitivity and possess great durability, a broader dynamic range and the possibility of operating under dynamic conditions.

A unit was created for nondestructive control of the thickness of dielectric and semiconductor layers, providing an immediate reading of the results of measurement at any point with a high degree of localization (1.0 micrometers).

The department of electronics and the problem laboratory of photothermoplastic recording at Kishinev State University are conducting work under the supervision of Professor L.M. Panasyuk on creation of new devices for recording optical information on the basis of semiconductor-dielectric systems.

The processes of formation both of latent electrostatic and visible images on semiconductor-thermoplastic systems were theoretically and experimentally investigated. The degree of influence of nonlinear characteristics of conductivity and photosensitivity on photographic parameters of the latent image was established. The existence was shown of electrostatic intensification at the stage of establishment of electrostatic contrast through redistribution of charging currents. A model was proposed of formation of an unstable equilibrium in the system semiconductor—heated thermoplastic. Processes of stoppage of instability were investigated and their characteristic parameters were determined for thermoplastic layers with different rheological properties. A qualitative coincidence was obtained of predicted theories of results with experimental research of the kinetics of charging individual layers of the photothermoplastic carrier as a whole and the kinetics of forming a phase relief at different times of exposition, of the potentials on the corona electrode and of recording temperatures. For the first time, the possibility was experimentally displayed of obtaining both negative and positive rastrirovannyye [(?)] images on one and the same photothermoplastic carrier with the help of variation in the time lag of turning on the exposition in regard to the start of charging.

The influence of technological factors on conductivity, drifting mobility, photosensitivity and optical energy activation in chalcogenide glassy semiconductors was investigated. The influence was shown of technological parameters on the density of traps determining the basic laws of charge transfer in forming electric images in chalcogenide glassy semiconductor-dielectric systems. The influence of impurities on the electrophotographic characteristics of layers of chalcogenide glassy semiconductors was studied and a technology was developed of homogeneous three- and four-component layers on long films. For the first time, technological conditions were developed for semiindustrial production of sharp and varizonnyye [variable zone (?)] heterostructures on long films, making it possible to increase three- to sixfold photographic sensitivity of the photothermoplastic carrier and .o expand 1.2- to twofold photographic width and gamma.

Research was conducted on heterostructures designated for recording images in various regions of the spectrum. The possibility was demonstrated for the first time of a shift of spectral sensitivity in the red range in single crystals with the creation of an amorphous layer-crystal heterojunction by means of ion implantation. In heterostructures, n-indium antimonide—p-cadmium telluride was shown and the effect of inversion of the sign of the photoelectromotive force in use of photon energy was explained. For the first time, heterostructures were created of germanium-zinc selenide and indium antimonide-cadmium telluride that were suitable for recording and storing optical information in the visible and infrared regions of the spectrum.

At the department of semiconductor and microelectron devices of Kishinev Polytechnic Institute imeni S. Lazo headed by Professor F.S. Shishiyanu, they are engaged in producing and studying crystals of $A^{II}B^{V}$, $A^{II}B^{V}$, $A^{II}CVI—B^{III}{}_2C^{VI}{}_3$ compounds.

Concentrations, the charge state and the enthalpy of formation of vacancies in semiconductors of the $A^{III}B^{V}$ group were determined. Mechanisms were studied of the interaction of impurities with simultaneous diffusion of deeply imbedded impurities in $A^{III}B^{V}$. The promising character was demonstrated of stabilization of the properties of crystals of this group and device structures on their basis by means of simultaneous diffusion doping with oxygen and an element of the iron group.

The physical bases were investigated of the reliability and degradation of semiconductor devices on the basis of $A^{III}B^{V}$ compounds. It was shown that physical effects due to degradation and reduced reliabillity of the devices are primarily controlled by diffusion processes and for this reason may arise in any thermal treatment of a semiconductor or in local heating as a result of an overload of the device. Practical recommendations were given on improving quality, reducing the dispersion of parameters and increasing the reliability of semiconductor devices.

A unit was developed for automatic recording of profiles of distribution of impurities according to the depth of the crystal, making it possible to exercise control over the position of impurities and vacancies in temperature treatment and degradation.

On the basis of theoretical investigations of processes of dissociative diffusion, ways were determined of optimizing profiles of distribution of impurities in the fabrication of device structures on the basis of gallium arsenide and phosphide. With the help of a computer, calculations were made of concentration profiles and parameters of diffusion required for the selection of optimal conditions of diffusion doping.

Highly effective diffusion light-emitting diodes of a yellow and green glow and diffusion diodes with a p-i-n structure possessing an S-shaped characteristic and the effect of switching emitted light were created.

A method of chemical tranport reactions was used to produce crystals of mercury selenogallate and solid solutions in the mercury selenide-gallium sesquiselenide system. The investigations of electrophysical properties of solid solutions in this system made it possible to determine the composition in the vicinity of mercury selenide in which an inversion of the zone structure takes place. Heterostructures were produced between the silicon and the heterovalent solid solutions cadmium selenide—gallium sesquiselenide. Their photoelectric properties were investigated and it was shown that the predominant mechanism of current transfer is the tunnel-recombination method. The maximum photo response of the heterojunctions is closer to the region of intrinsic absorption of silicon.

The method of gg-modulation spectroscopy was developed and with its aid photoconductivity of semiconductor crystals and the photo response of surface-barrier structures of the type of Shottka diodes on their basis were investigated. Electronic states were studied in crystals of cadmium and zinc diphosphide and gallium phosphide. Their zone structure was pinpointed. Diode structures were produced on crystals of the $A^{II}B^{V}{}_2$ group, in particular cadmium diphosphide, by diffusion doping with mercury and sulfur. It was demonstrated that the intensity of the light response of such a p-n-junction exceeds by one order of magnitude the photo response of the Shottka diode on the same material.

At the sectoral scientific-research laboratory of electronics at Kishinev Polytechnic Institute, work was conducted under the supervision of Docent I.P. Molodyan on producing and studying semiconductor materials and opto- and microelectronic devices on the basis of compounds of the $A^{III}B^{V}$ type.

The method of liquid-phase epitaxy was used in the production of thin films and heterostrctures of $A^{III}B^{V}$ compounds and also of solid solutions on their basis. The influence of the composition of the liquid phase, the

growth temperature, rate and temperature range of cooling, type of substrate, form of doping impurity and volume of the solution-melt was studied on the speed of crystallization, morphology of the films and uniformity and perfection of the structure. Perfectly uniform layers of indium phosphide and the solid solutions aluminum arsenide-gallium arsenide and indium antimonide-gallium antimonide were produced.

The method of electroliquid-phase epitaxy with back pressure produced epitaxial layers of gallium phosphide with a relationship of intensities increased by more than one order of magnitude in the luminiscence of the green and red bands, which made it possible to create light-emitting diodes of yellow glow with improved color and a high quantum effectiveness.

Gann's diodes were created on the epitaxial layers of indium phosphide. They possessed reduced noise characteristics and higher efficiency, temperature stability and operating frequency (up to 180 gigahertz). On similar layers, Shottka's diodes were created, possessing high sensitivity with null displacement and, in distinction to surface-barrier structures on silicon and germanium, can operate at cryogenic temperatures.

On the basis of heterostructures in the aluminum arsenide-gallium arsenide system, coordinate sensitive photodetectors were created with constant sensitivity in a broad range of wave lengths and fast speed on the order of $5x10^{-5}$ second. They can find application in automatic systems of photoelectronic tracking and in optoelectronic systems for receipt and processing of information.

Processes of selective growth and pickling in the technology of fabrication of device structures for optical integrated circuits and fiber communication on heterojunctions of the gallium arsenide—aluminum arsenide system were studied and developed. With their use, sources of coherent and spontaneous radiation were developed and fabricated for optical integrated circuits and light-fiber communication. Principles were worked out for creating matrices of optical-channel switches for light-emitting diodes for communication equipment and computers.

For nondisruptive control of the quality of semiconductor materials at different stages of the technological cycle for production of semiconductor products as well as parameters of semiconductor devices and complex integrated circuits, a laser scanning microscope was created without any commercial comparable products either in the USSR or abroad. It has a spacial resolution of 1-2 micrometers and a number of resolving elements in the field of vision of up to $5x10^4$ and can operate in a range of wave lengths of 0.44-3.39 micrometers under conditions of photo response or for reflection.

A group of the laboratory's young staff workers in 1980 was awarded the Prize of Komsomol of Moldavia imeni B. Glavan in the field of science and technology for work on research of technological and physical processes and phenomena in conductors for the purpose of opto- and superhigh frequency electronics and in 1983, the Lenin Komsomol Prize. **At the physics department of Kishinev Agricultural Institute imeni M.V. Frunze,** scientific-research work is being conducted under the supervision of Professor A.G. Cheban in the field of agricultural photo power engineering [fotoenergetika]—the study of methods of direct transformation of solar energy into electric power with the help of semiconductor photoelectric stations. The complex of investigations includes study of the dependence of parameters of photo transformers on external conditions characteristic of the MSSR: solar radiation, humidity and also the influence of the atmosphere and microorganisms. Photosensors are being investigated and developed on various semiconductor structures intended for recording intensity and dose of solar radiation as well as various semiconductor structures for the purpose of creating devices for measuring parameters (spectral characteristics, dose and so forth) of photosynthetic active radiation playing a decisive role in the development and synthesis of biomass.

Sectoral Institutes

At the Moldavian Division of the All-Union Scientific-Research and Planning-Design Institute of Current Sources, scientific-research and experimental-design work is proceeding on the creation of electrogenerating and thermocooling devices based on semicondcutor materials.

A technology was developed of producing laminated single crystals of ternary compounds of the type of $A^{III}B^{V}C^{VI}_2$. Phase equilibriums were studied and diagrams made of the state of sections of ternary thallium—arsenic—chalcogen systems. Together with personnel of the semimetal physics laboratory of the Institute of Semiconductor Physics of the MSSR Academy of Sciences, a diagram was constructed of the state of the $TlSbS_2$-$TlBiS_2$ systems, and slight reciprocal solubility of the examined compounds was found. A comprehensive investigation was conducted of the physico-chemical and electrophysical properties of these single crystals and the $TlSbSe_3$ in a broad range of temperatures and wave lengths.

The floating-zone method was used to grow single crystals of low-temperature thermoelectric materials—sold solutions of bismuth telluride-bismuth selenide and bismuth telluride-antimony telluride with coefficients of thermoelectromotive force of about $2x10^{-4}$ V/K. On their basis, thermoelectric microscopic stages with various stabilization temperatures intended for investigations of the processes of freezing and sublimation drying under a microscope and in transmitted light were created.

Due to the expansion of use of semiconductor devices under rigid temperature conditions, the possibilities were studied of creating power diodes on the basis of

broad-zone semiconductor materials for the purpose of increasing the working temperature range. Ways were studied of creating a rectified diode on multilayer epitaxial structures of gallium arsenide combining slight power dissipation with high reverse breakdown voltage (up to 2,000 v). Anomalous photovoltaic and photo magnetic effects in complex semiconductors and the possibilities of utilizing them in device structures were investigated.

In the decisions of the 27th CPSU Conference basic positions were formulated relating to acceleration of scientific and technical progress. Progress will be determined to a significant degree by microelectronic computer technology and instrument making, sectors that are developing most rapidly in the republic.

Within the framework of the problems of the Scientific Council "Semiconductor Physics and Chemistry," scientists and specialists of the MSSR Academy of Sciences, VUZ's and sectoral institutes of the republic will conduct during the 12th Five-Year Plan comprehensive investigations of the physical bases of semiconductor study of materials. These investigations will make it possible to expand the range of physical phenomena embodied in the principles of operation of new electronic devices and to disclose new effective technologies and materials for introduction into semiconductor production.

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Statistics on Azerbaijan Science, Technical Progress

18140133 Baku KOMMUNIST AZERBAYDZHANA in Russian No 9, Sep 87 pp 102-104

[Article under the rubric "For Propagandists and Lecturers. Figures and Facts": "Science and Technical Progress in the Azerbaijan SSR"; article based on materials of the Azerbaijan SSR State Committee for Statistics]

[Text] A large scientific potential has been created in our republic. The number of scientists, science teachers, and specialists, who are employed in scientific work, in 1986 exceeded 23,000. Of them 10,700, or nearly 1 in 2, had the highest scientific qualifications—the academic decree of doctor or candidate of sciences. In the past 20 years the number of scientists has increased by 1.9-fold, the number of people with the academic degree of doctor or candidate has increasec by 3.2-fold. More than 7,000 scientists had academic titles, among them 116 had the titles of academicians (full members) and corresponding members of the academy.

Women are taking an extensive part in the sphere of science. Among scientists of the republic they make up 38 percent, among doctors and candidates of sciences—respectively 10 and 24 percent. In all 75 women had the title of academician, corresponding member, and professor.

More than a quarter (28 percent) of the total number of scientists are employed in the field of technical sciences, 10 percent—in the field of physical mathematical sciences, 12 percent—in the field of social sciences, 6 percent—in the field of medical sciences, 8 percent—in the field of chemical sciences, 6 percent—in the field of biological sciences, and 5 percent—in the field of agricultural sciences.

Spending on Science From the State Budget and Other Sources (millions of rubles)

1960	1970	1980	1985
19.0	30.8	36.9	40.3

During the past three five-year plans 558 models of new types of machines, equipment, apparatus, and instruments were developed by scientific and planning and design organizations and industrial enterprises. In all 575 new types of industrial products were assimilated for the first time in the USSR. During this period 780 obsolete machines, equipment, and instruments were removed from production.

In industry there are 3,107 completely mechanized, flow, and automatic lines and 1,523 completely mechanized and automated sections, shops, and works. Of this number 32 percent of the lines and 22 percent of the sections and shops were introduced during the 11th Five-Year Plan.

Equipment with program control is finding extensive application. As of 1 January 1987 there are 491 NC machine tools, 223 industrial robots, and 35 balance-arm manipulators.

The introduction of electronics in all fields of science, production, and management has undergone much development. In 15 years 132 automated control systems were developed, 59 percent of them were developed during the years of the 11th Five-Year Plan. In 1986 eight automated control systems were put into operation, of them two are computer-aided design systems.

The introduction of scientific and technical progress in production is characterized by the fact that during each of the past five-year plans the volumes have increased and the economic efficiency of the introduction of new equipment has grown. During 1971-1985, 87,100 measures were introduced in industry (on the average 4,400 measures a year during the 9th Five-Year Plan and 7,000

ЧИСЛО НАУЧНЫХ УЧРЕЖДЕНИЙ
(на конец года)

	1960	1970	1980	1986
(1) Всего научных учреждений (включая высшие учебные заведения)	107	142	12[illegible]	125
(2) в том числе:				
(3) научно-исследовательские институты, их филиалы и отделения	48	73	68	80

Number of Scientific Institutions (at the end of the year)

Key:
1. All scientific institutions (including high educational institutions)
2. Including
3. Scientific research institutes, their affiliates and departments

a year during the 11th Five-Year Plan), the actual

ЧИСЛЕННОСТЬ НАУЧНЫХ РАБОТНИКОВ
(на конец года)

	1960	1970	1980	1985	1986
(1) Всего научных работников (включая научно-педагогические кадры вузов), тыс. человек	7,2	17,1	22,0	23,2	23,1
(2) Из них имеют, в %:					
(3) ученую степень:					
(4) доктора наук	2,6	3,8	4,1	4,2	4,4
(5) кандидата наук	27,4	31,3	37,2	40,4	41,8
(6) ученое звание:					
(7) академика, члена-корреспондента, профессора	2,8	3,0	3,2	3,3	3,6
(8) доцента	10,3	6,7	9,9	11,9	12,1
(9) старшего научного сотрудника	6,6	7,0	6,9	7,5	8,0
(10) младшего научного сотрудника	9,4	12,0	10,6	8,9	7,6

Number of Scientists (at the end of the year)

Key:
1. All scientists (including science teachers of higher educational institutions), thousands
2. Of them those having, in percent:
3. The academic title of:
4. Doctor of sciences
5. Candidate of sciences
6. The academic title of:
7. Academician, corresponding member, professor
8. Docent
9. Senior scientific associate
10. Junior scientific associate

expenditures came to 2,161,500,000 rubles (70.7 million rubles and 211.5 million rubles), the number of conditionally freed workers came to 52,700 (2,300 and 4,700), the annual economic impact from the introduction of new equipment came to 908.5 million rubles (31.9 million rubles and 82.0 million rubles).

At the same time, although the pool of mechanized and automatic equipment, devices, and units (NC metal-cutting machine tools, industrial robots) is being enlarged, their introduction is still inadequate. The pace of the updating of machine building products is also not at the proper level. The plan of the development of science and technology is not being fulfilled. The time of the development and production of models remains long.

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ЦИФРЫ И ФАКТЫ 103

ЧИСЛЕННОСТЬ ЖЕНЩИН В СОСТАВЕ НАУЧНЫХ РАБОТНИКОВ
(на конец года)

	1960	1970	1980	1986
(1) Всего женщин — научных работников	2443	5903	8385	9722
(2) из них имеют (в %)				
(3) ученую степень:				
(4) доктора наук	0,5	1,3	1,2	1,1
(5) кандидата наук	16,3	19,4	23,6	26,7
(6) ученое звание:				
(7) академика, члена-корреспондента, профессора	0,5	0,8	0,9	0,9
(8) доцента	3,6	2,6	4,3	6,4
(9) старшего научного сотрудника	4,6	4,4	4,0	5,3
(10) младшего научного сотрудника и ассистента	14,2	16,0	10,3	8,5

Number of Women Among Scientists (at th. end of the year)

Key:
1. All women scientists
2. Of them those having (in percent)
3. The academic degree of:
4. Doctor of sciences
5. Candidate of sciences
6. The academic title of:
7. Academician, corresponding member, professor
8. Docent
9. Senior scientific associate
10. Junior scientific associate and assistant lecturer

ЧИСЛЕННОСТЬ НАУЧНЫХ РАБОТНИКОВ ПО ОТРАСЛЯМ НАУК
(на конец года)

	1960	1970	1980	1985	1986
(1) Всего:	7226	17082	21993	23182	23060
(2) в том числе по отраслям наук:					
(3) физико-математических	429	1274	2102	2220	2392
(4) химических	594	1414	1810	1830	1787
(5) биологических	412	994	1375	1528	1462
(6) геолого-минералогических	572	849	875	909	983
(7) технических	1956	5325	6376	6639	6404
(8) сельскохозяйственных	489	939	1153	1151	1188
(9) исторических	361	616	733	783	794
(10) экономических	246	1016	1404	1502	1361
(11) философских	76	286	409	487	479
(12) филологических	559	1462	1878	2040	2117
(13) географических	87	207	311	306	315
(14) юридических	45	112	158	184	187
(15) педагогических	367	742	758	943	918
(16) медицинских	676	967	1422	1478	1475
(17) фармацевтических	19	16	32	28	28
(18) ветеринарных	83	120	148	135	141
(19) искусствоведения	131	376	423	448	460
(20) архитектуры	29	50	75	92	91
(21) психологических	—	40	78	65	64
(22) других	95	277	473	414	414

Number of Scientists by Fields of Sciences (at the end of the year)

Key:
1. Total
2. Including by fields of sciences:
3. Physical mathematical
4. Chemical
5. Biological
6. Geological mineralogical
7. Technical
8. Agricultural
9. Historical
10. Economic
11. Philosophical
12. Philological
13. Geographical
14. Juridical
15. Pedagogical
16. Medical
17. Pharmaceutical
18. Veterinary
19. Art criticism
20. Architecture
21. Psychological
22. Others

ЧИСЛЕННОСТЬ И ВЫПУСК АСПИРАНТОВ

	1960	1970	1980	1985	1986
(1) Численность аспирантов (на конец года). Всего:	1044	1991	1551	1626	1558
(2) Из них обучающихся:					
(3) с отрывом от производства	870	1185	448	591	562
(4) без отрыва от производства	174	806	1103	1035	996
(5) Из общего числа обучались (в %):					
(6) в научных учреждениях	54,9	66,0	60,2	60,5	59,1
(7) в высших учебных заведениях	45,1	34,0	39,8	39,5	40,9
(8) Всего выпущено за год	118	525	380	386	436
(9) Из числа обучавшихся:					
(3) с отрывом от производства	101	376	127	178	190
(4) без отрыва от производства	17	149	253	208	246
(10) Из общего выпуска обучались (в %):					
(6) в научных учреждениях	68,6	69,7	63,7	58,0	61,5
(7) в высших учебных заведениях	31,4	30,3	36,3	42,0	38,5

Number and Graduation of Graduate Students

Key:
1. Number of graduate students (at the end of the year). Total
2. Of them those who are studying:
3. With leave from work
4. Without leave from work
5. Of the total number those who studied (in percent):
6. At scientific institutions
7. At higher educational institutions
8. Total graduated during the year
9. Among those who studied:
10. Of the total number of graduates those who students (in percent):

a year during the 11th Five-Year Plan), the actualexpenditures came to 2,161,500,000 rubles (70.7 million rubles and 211.5 million rubles), the number of conditionally freed workers came to 52,700 (2,300 and 4,700), the annual economic impact from the introduction of new equipment came to 908.5 million rubles (31.9 million rubles and 82.0 million rubles.)

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Paton on Significance of Works of Ukrainian State Prize Winners

18140187b Kiev PRAVDA UKRAINY in Russian 25 Dec 87 p 2

[Article by President of the Ukrainian SSR Academy of Sciences Academician B.Ye. Paton, chairman of the Committee for Ukrainian SSR State Prizes in Science and Technology attached to the Ukrainian SSR Council of Ministers and twice Hero of Socialist Labor: "The Achievements of Science in the Service of Production. President of the Ukrainian SSR Academy of Sciences Academician B.Ye. Paton, chairman of the Committee for Ukrainian SSR State Prizes in Science and Technology and twice Hero of Socialist Labor, Gives an Account"]

[Text] The decree of the Ukrainian CP Central Committee and the republic Council of Ministers, in which the names of the winners of the 1987 Ukrainian SSR State Prizes in Science and Technology are identified, was adopted on the eve of the 70th anniversary of the proclamation of Soviet power in the Ukraine. With all my heart I congratulate the scientists, specialists, and worker-innovators, whose contribution to the development of scientific research and the devising of advanced equipment and fundamentally new technologies is significant.

Often people ask the question: How does the selection of workers for the awarding of the prizes take place in the committee? If I am to answer briefly, it is in an exacting and democratic manner. A wide range of scientists and specialists are enlisted in the discussion. The opinions of authoritative figures of science and technology were published on the pages of republic, many oblast, city, and rayon newspapers. Republic television was involved in this matter. Hundreds of letters with suggestions and critical remarks were addressed to the committee. All the materials were studied in detail, including with a trip to the sites, and were analyzed by experts. A work was awarded the prize, when in case of a secret ballot three-fourths of the votes of the committee members who were present were cast for it.

Now about the works themselves, which were awarded during this anniversary year the republic State Prizes. The series of basic works on functional analysis, which was prepared by the well-known scientists Academician Nikolay Nikolayevich Bogolyubov and Corresponding Member of the Ukrainian SSR Academy of Sciences Mark Grigoryevich Kreyn, starts the list of them. The new mathematical methods of solving problems in nonlinear and quantum mechanics and theoretical physics, which were proposed by them, are being used by researchers and engineers, who work in various fields of science and are engaged in the development of equipment.

Biologists received deserved recognition. Thus, the collective of researchers headed by Academician of the Ukrainian SSR Academy of Sciences Valeriy Veniaminovich Smirnov on the basis of the discovery of the laws of the interactions of a warm-blooded living organism with aerobic spore-forming bacteria proposed and introduced in practice the fundamentally new preparation Bakterin-SL which does not have analogs in the world—for the preventive treatment and treatment of young animals.

Another work of biologists is also of great national economic importance. It is a question of effective biological preparations for the suppression of the number of blood-sucking mosquitoes in various zones of the country. I will emphasize that the preparations are safe for man, warm-blooded animals, and plants.

Among the winners is Doctor of Geological Mineralogical Sciences Professor Yuriy Vasilyevich Timoshin, who was awarded the lofty title for the development of a theory and methods, which make it possible to obtain information on the structure of a geological medium and the physical properties of its individual rocks in the form of images, by using the diffraction holographic conversion of seismic wave fields. These methods, as practical experience shows, increase significantly the effectiveness of the search for minerals.

The developers of new technologies in horticulture and vegetable growing were commended by the prize. Owing to the scientists of the Mliyevskiy Experimental Station of Horticulture imeni L.P. Smirenko, now orchards of small trees are being cultivated on large areas. They yield marketable crops 5-6 years after planting, require one-third to one-half as many expenditures on care and the harvesting of the fruit, and, consequently, decrease the production cost of what has been grown.

The plantations of hothouses, at which the carbon dioxide top dressing of plants with the waste gases of boiler houses, which was proposed by scientists and specialists, now winners, is being used, are expanding from year to year. Fuel is being saved, manual labor in caring for vegetables is being drastically reduced, and the yield is increasing.

For long years medical personnel and biochemists under the supervision of Academician of the Ukrainian SSR Academy of Sciences Vladimir Aleksandrovich Belitser conducted research in the area of enzymology. They substantiated scientifically and introduced in clinical practice more reliable methods of the diagnosis and treatment of various diseases with the use of enzyme preparations.

Among the winners are the authors of a fundamentally new technology and equipment for the welding of heat-hardened rails. The mechanical properties of the butt joint turn out to be at the level of the basic metal. The

time of welding is reduced to nearly one-half. Such welding machines are used in case of the building and renovation of railroads. They are being exported to many foreign countries.

There is another interesting work. Scientists and production workers on the basis of basic research determined the rate of formation of defects in crystals and their effect on the mechanical and electrophysical properties of semiconductor materials. More economical industrial technologies of the production of semiconductor structures for modern microelectronics were proposed.

The creative labor of scientists headed by Doctor of Physical Mathematical Sciences Anatoliy Ivanovich Kalmykov was worthily appreciated. They developed radar methods and equipment of the remote probing of the earth from aerospace vehicles. This made it possible, in particular, to detect currents and subsurface waves in oceans, to compile promptly maps of the ice conditions in the Arctic and Antarctica, and to obtain information on global processes in the atmosphere of the earth.

A group of specialists, who proposed and successfully carried out the renovation of units in the blast furnace shop of the Zhdanov Metallurgical Combine imeni Ilich, became a winner. It is noteworthy that everything was carried out without halting production, in a short time. As a result the technological parameters of the blast furnace were improved, the consumption of coke was reduced, and the quality of the smelted pig iron was increased. More than 13 million rubles—renovation provided such an annual economic impact.

Lofty awards were presented to the developers of unique power equipment—block transformers of the maximum powers. In their characteristics such transformers not only are not inferior to the best models of foreign firms, but with respect to a number of parameters, for example, reliability, surpass them.

The new technologies of producing ceramic brick from carbonaceous waste products are called upon to serve the expansion of the production of high-quality construction materials. The obtained items have high mechanical and thermal physical properties, their production requires fewer energy expenditures. A merit of the innovative work is the fact that ecological problems were also solved.

Refrigerator trucks with nitrogen cooling systems, which are used for the transportation of perishable products, have already been customary for the residents of many industrial centers and resort zones. Such vehicles are not inferior to the analogs being produced in the FRG, England, and the United States. In case of their use the high keeping capacity of products is ensured and toxic air emissions are significantly reduced. The developers of this equipment are workers of the Physical Technical Institute of Low Temperatures of the Ukrainian SSR Academy of Sciences and enterprises of the republic Ministry of Motor Transport.

Here is what it is possible to say briefly about the works. Their effectiveness is more evidence that the development of science and the quickest use of its achievements in practice are becoming a powerful level of progress in production and the successful solution of social problems. Therefore, the restructuring in the activity of creative collectives both at research organizations and at enterprises should be subordinated to the acceleration of this process. The decisions, which were drawn up by the 27th CPSU Congress, orient us toward precisely such an approach.

In conclusion I once again congratulate the winners on the 70th anniversary of the proclamation of Soviet power in the Ukraine. I wish them successes in work, good health, and happiness.

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Awarding of 1987 Ukrainian State Prizes in Science, Technology

18140187a Kiev PRAVDA UKRAINY in Russian 25 Dec 87 pp 1-2

[Decree of the Ukrainian CP Central Committee and the Ukrainian SSR Council of Ministers: "On the Awarding of the 1987 Ukrainian SSR State Prizes in Science and Technology"]

[Text] The Central Committee of the Communist Party of the Ukraine and the Ukrainian SSR Council of Minister, having considered the representation of the Committee for Ukrainian SSR State Prizes in Science and Technology, resolve to award the 1987 Ukrainian SSR State Prizes to:

In Science and Technology

1. Academician Nikolay Nikolayevich Bogolyubov, director of the Joint Institute for Nuclear Research; Corresponding Member of the Ukrainian SSR Academy of Sciences Mark Grigoryevich Kreyn, scientific associate-consultant of the Institute of Physical Chemistry imeni A.V. Bogatskiy of the Ukrainian SSR Academy of Sciences—for the series of works "New Methods of Functional Analysis for the Solution of Problems of Mathematical Physics and Function Theory."

2. Academician of the Ukrainian SSR Academy of Sciences Valeriy Veniaminovich Smirnov, director of the Institute of Microbiology and Virology imeni D.K. Zabolotnyy of the Ukrainian SSR Academy of Sciences, supervisor of the work; Doctor of Medical Sciences Semen Rafailovich Reznik, leading scientific associate of the same institute; Doctor of Medical Sciences Vladimir Yakovlevich Chaplinskiy, senior microbiologist of the Dnepropetrovsk Chemical and Pharmaceutical Plant;

Candidate of Veterinary Sciences Vladimir Petrovich Litvin, head of a chair, Candidate of Biological Sciences Svetlana Nikolayevna Kharchenko, docent, workers of the Ukrainian Agricultural Academy—for the series of works "The Development of the Scientific Principles of the Use of Bacteria as a Preventive Medical Agent, the Development on This Basis of the Preparation Bakterin-SL, the Organization of Its Production and Large-Scale Use."

3. Candidate of Biological Sciences Natalya Dmitriyevna Tolkach Mikhnovskaya, docent, Candidate of Biological Sciences Nadezhda Grigoryevna Dashkina, head of a problem laboratory, Candidates of Biological Sciences Oleg Viktorovich Viktorov-Nabokov, Leonid Petrovich Buchatskiy, and Vilen Pavlovich Sheremet, senior scientific associates, Irina Pavlovna Kostyuchenko, junior scientific associate, workers of Kiev State University imeni T.G. Shevchenko; Doctor of Medical Sciences Vera Lvovna Vasilyeva, head of a laboratory of the Kiev Scientific Research Institute of Epidemiology and Infectious Diseases imeni L.V. Gromashevskiy; Doctor of Biological Sciences Nikolay Vasilyevich Kandybin, head of a laboratory, Candidate of Biological Sciences Nadezhda Mikhaylovna Barbashova, senior scientific associate, workers of the All-Union Scientific Research Institute of Agricultural Microbiology; Doctor of Biological Sciences Viktoriya Petrovna Dremova, head of a department of the All-Union Scientific Research Institute of Disinfection and Sterilization—for the development and the substantiation of the use of microbiological means of controlling blood-sucking diptera.

4. Doctor of Technical Sciences Yuriy Vasilyevich Timoshin, head of a chair of Kiev State University imeni T.G. Shevchenko—for a series of works on the principles of the theory and methods of the diffraction (holographic) conversion of pulsed seismic recordings into an image of geological media, which was published during 1972-1985.

5. Doctor of Economic Sciences Nikolay Mikhaylovich Artemenko, director of the Mliyevskiy Experimental Station of Horticulture imeni L.P. Simirenko, supervisor of the work; Candidate of Agricultural Sciences Mikhail Vasilyevich Andriyenko, director of the Ukrainian Scientific Research Institute of Horticulture; Mikhail Iosifovich Ponomar, chairman of the Kolkhoz imeni Krupskaya of Cherkasskiy Rayon of Cherkassy Oblast; Grigoriy Andreyevich Lyakhovets, agronomist-horticulturist of the same kolkhoz; Vladimir Sergeyevich Rachenko, chairman of the Druzhba Kolkhoz of Chigirinskiy Rayon of Cherkassy Oblast; Ivan Ivanovich Zakharchenko, agronomist-horticulturist of the same kolkhoz; Yakov Anisimovich Denisenko, deputy chairman of the Kolkhoz imeni Shevchenko of Chernobayevskiy Rayon of Cherkassy Oblast—for the development and introduction in production of a technology of intensive orchards made up of small trees on seedling stocks.

6. Doctor of Biological Sciences Boris Ivanovich Gulyayev, head of a department, Candidate of Biological Sciences Boris Aleksandrovich Mitrofanov, senior scientific associate, workers of the Institute of Plant Physiology of the Ukrainian SSR Academy of Sciences; Candidate of Chemical Sciences Mariya Gavrilovna Martsenyuk-Kukharuk, leading scientific associate of the Institute of Physical Chemistry imeni L.V. Pisarzhevskiy of the Ukrainian SSR Academy of Sciences; Candidate of Chemical Sciences Aleksandr Vasilyevich Fesenko, head of a laboratory of the Institute of Surface Chemistry of the Ukrainian SSR Academy of Sciences; Candidate of Agricultural Sciences Maksim Alekseyevich Buts, director of the Kiev Experimental Model Farm for Decorative Horticulture; Semen Petrovich Kovalchuk, chief engineer, Petr Naumovich Tomashpolskiy, chief specialist, workers of the republic cooperative state planning, surveying, and scientific research association of the Ukrainian SSR State Agroindustrial Committee; Leonid Terentyevich Sulima, chief agronomist, Yuriy Aleksandrovich Yakovenko, chief engineer, workers of the Kiyevskaya ovoshchnaya fabrika Hothouse Sovkhoz; Doctor of Chemical Sciences Grigoriy Petrovich Korneychuk (posthumously)—for the development and introduction of a system of the carbon dioxide top dressing of plants of protected soil with catalytically purified waste gases of boiler houses.

7. Academician of the Ukrainian SSR Academy of Sciences Vladimir Aleksandrovich Belitser, head of a department of the Institute of Biochemistry imeni A.V. Palladin of the Ukrainian SSR Academy of Sciences, supervisor of the work; Doctor of Biological Sciences Tamara Vladimirovna Varetskaya, senior scientific associate-consultant of the same institute; Doctor of Biological Sciences Kuzma Nikitovich Veremeyenko, head of a laboratory, Doctor of Medical Sciences Grigoriy Avdeyevich Opanashchenko, head of a department, workers of the Kiev Scientific Research Institute of Otolaryngology imeni Professor A.S. Kolomiychenko; Doctor of Medical Sciences Lyubov Leontyevna Gromashevskaya, head of a laboratory of the Kiev Scientific Research Institute of Epidemiology and Infectious Diseases imeni L.V. Gromashevskiy; Doctor of Medical Sciences Nikolay Fedorovich Danilevskiy, head of a chair of the Kiev Medical Institute imeni Academician A.A. Bogomolets; Doctor of Biological Sciences Nikolay Mikhaylovich Petrun, head of a laboratory of the Kiev Scientific Research Institute of Urology and Nephrology—for the series of works "The Development of the Theoretical Principles of Medical Enzymology and the Introduction of Its Methods in the Clinic."

8. Candidate of Technical Sciences Valeriy Georgiyevich Krivenko, deputy chief, Ivan Leontyevich Lazebnyy, engineer-technologist, workers of the experimental design and technological bureau of the Institute of Electric Welding imeni Ye.O. Paton of the Ukrainian SSR Academy of Sciences; Ivan Korneyevich Golomovzyuk, fitter of the experimental works of the same institute;

Candidate of Technical Sciences Iosif Zelikovich Genkin, head of a laboratory, Candidate of Technical Sciences Vladimir Borisovich Shlyapin, head of a department, workers of the All-Union Scientific Research Institute of Rail Transport; Vladimir Vasilyevich Lyadov and Viktor Mikhaylovich Kuznetsov, chiefs of departments of the USSR Ministry of Railways; Fillip Ivanovich Peretrukhin, director of the Kakhovka Plant of Electric Welding Equipment; Aleksandr Grigoryevich Galinskiy, leader of a brigade of fitters of the same plant—for the development and introduction of a technology and equipment for the welding of heat-hardened rails.

9. Doctor of Physical Mathematical Sciences Petr Ivanovich Baranskiy, head of a department, Candidate of Physical Mathematical Sciences Boris Nikolayevich Romanyuk, senior scientific associate, Vladimir Ivanovich Dumbrov, chief engineer, Gennadiy Kuzmich Zheludev, chief process engineer, workers of the Institute of Semiconductors of the Ukrainian SSR Academy of Sciences; Corresponding Member of the Ukrainian SSR Academy of Sciences Ivan Stepanovich Gorban, Doctor of Physical Mathematical Sciences Vladimir Arsenyevich Makara, heads of chairs, Doctor of Physical Mathematical Sciences Nikolay Nikolayevich Novikov, dean of a faculty, workers of Kiev State University imeni T.G. Shevchenko; Doctor of Physical Mathematical Sciences Yuliy Viktorovich Milman, head of a department, Candidate of Technical Sciences Irina Vitalyevna Gridneva, head of a laboratory, workers of the Institute of Problems of Material Science imeni I.N. Frantsevich of the Ukrainian SSR Academy of Sciences; Doctor of Physical Mathematical Sciences Vitaliy Pavlovich Shapovalov, professor of the Zaporozhye Machine Building Institute imeni V.Ya. Chubar—for the series of works "The Development of the Physical Principles of the Strength of Covalent Crystals and the Optimization on This Basis of the Technologies of the Production of Semiconductor Structures of Microelectronics."

10. Doctor of Physical Mathematical Sciences Anatoliy Ivanovich Kalmykov, head of a department of the Institute of Radio Physics and Electronics of the Ukrainian SSR Academy of Sciences, supervisor of the work; Candidate of Physical Mathematical Sciences Aleksandr Petrovich Pichugin, Vladimir Aleksandrovich Komyak, heads of laboratories, Petr Mikhaylovich Torchun, head of a sector of the special design and technological bureau, Candidate of Technical Sciences Aleksandr Sergeyevich Kurekin, senior scientific associate, Candidate of Technical Sciences Valeriy Nikolayevich Tsimbal, Valentin Borisovich Yefimov, Veniamin Izraylevich Zeldis, Veniamin Vladimirovich Igolkin, scientific associates, Yuriy Viktorovich Zakharov, electrician, workers of the same institute—for the development of radar methods of the study (remote probing) of the natural environment of the earth from aerospace vehicles and their introduction.

11. Candidate of Technical Sciences Stanislav Tikhonovich Pliskanovskiy, USSR First Deputy Minister of Ferrous Metallurgy, supervisor of the work; Yevgeniy Aleksandrovich Tsaritsyn, chief engineer, Igor Mikhaylovich Peftiyev, deputy chief engineer, Igor Ivanovich Petrov, operator of a burden feeder, Viktor Petrovich Bogoditsa, Georgiy Pavlovich Shatunov, deputy chiefs of a shop, Anisim Anatolyevich Gamolskiy, deputy chief of a department, workers of the Zhdanov Metallurgical Combine imeni Ilich; Konstantin Gavrilovich Shulichenko, chief project engineer of the Ukrainian State Planning and Planning and Design Institute of Electrical Equipment for Heavy Industry; Dmitriy Yakovlevich Demenkov, chief of Zhdanov Specialized Administration No 2 of the Donbassdomnaremot Trust; Grigoriy Borisovich Rabinovich, former chief blast furnace operator of the technical division of the republic industrial association of metallurgical enterprises—for the development and implementation of effective technical solutions with regard to the renovation and modernization of units of the blast furnace shop without halting production for the purposes of the improvement of the technical and economic indicators, product quality, and working conditions.

12. Candidate of Technical Sciences Ivan Dementyevich Voyevodin, director, Candidate of Technical Sciences Vladimir Vasilyevich Bodnar, Mikhail Andreyevich Afanasyev, heads of departments, Candidate of Technical Sciences Lazar Naumovich Shifrin, head of a design bureau, workers of the All-Union Scientific Research, Planning, Design, and Technological Institute of Transformer Building; Doctor of Technical Sciences Adolf Nikitovich Kravchenko, leading scientific associate of the Institute of Electrodynamics of the Ukrainian SSR Academy of Sciences; Doctor of Physical Mathematical Sciences Leonid Pavlovich Nizhnik, leading scientific associate of the Institute of Mathematics of the Ukrainian SSR Academy of Sciences; Ukrainian SSR Deputy Minister of Power and Electrification Ivan Ivanovich Magda; Eduard Mikhaylovich Talin, deputy chief process engineer of a plant, Valentin Konstantinovich Bezus, deputy chief of a shop, Viktor Anatolyevich Andreyev, senior chief engineer, workers of the Zaporozhtransformator Production Association imeni V.I. Lenin—for the development of the scientific principles of the designing and for the production and introduction of block transformers of maximum powers.

13. Ukrainian SSR Minister of the Construction Materials Industry Aleksandr Tikhonovich Shevchenko; Doctor of Technical Sciences Aleksey Arsentyevich Krupa, head of a chair of Kiev Polytechnical Institute imeni 50-letiya Velikoy Oktyabrskoy sotsialisticheskoy revolyutsii; Candidate of Technical Sciences Sergey Ivanovich Bondarenko, general director of the Stroymaterialy Scientific Production Association; Candidate of Technical Sciences Dmitriy Ivanovich Shvayka, chief engineer of the Kiev Experimental Pilot Plant of the same association; Candidate of Technical Sciences Vladimir Ivanovich Mikhaylov, senior scientific associate of the State Scientific Research, Planning, and Design Institute of Construction Materials and Items; Candidate of Technical Sciences Sergey Georgiyevich Nesterovskiy, chief of

the republic industrial association of wall materials; Candidate of Technical Sciences Zinaida Sergeyevna Krasilnikova, head of a sectorial scientific research laboratory of the Kiev Institute of Construction Engineering; Vasiliy Konstantinovich Panasko, chief engineer, Valeriy Ivanovich Simakhin, leader of a multiple-skill brigade of fitters, workers of the Voroshilovgradstroymaterialy Oblast Production Association—for the development and introduction of energy- and resource-saving technologies of ceramic wall materials on the basis of the use of carbonaceous waste products as raw materials.

14. Ukrainian SSR Deputy Minister of Motor Transport Aleksandr Nikolayevich Artemenko; Roman Petrovich Ivasishik, deputy chief of an administration of the same ministry; Grigoriy Iosifovich Khorash, chief engineer, Eduard Aleksandrovich Amelin, leading designer of a special design and technological bureau, Ivan Mikhaylovich Smetana, lathe operator of a pilot plant, workers of the Physical Technical Institute of Low Temperatures of the Ukrainian SSR Academy of Sciences; Ivan Grigoryevich Krivoshapov, chief engineer of the Khakkov Kharkovagropromtrans Production Association; Gennadiy Viktorovich Topor, director of the Vetka Pilot Plant of the 4th Gorlovka Avtoremont Production Association; Oleg Maksimovich Kovalenko, chief engineer of Kharkov Motor Transport Enterprise 36301; Arnold Aleksandrovich Pentsarskiy, head of a department of the State Scientific Research and Planning Institute of Motor Transport; Vyacheslav Maksimovich Boychuk, engineer-mechanic (posthumously)—for the development and introduction of medium-duty refrigerator trucks with nitrogen cooling systems for the transportation of perishable products.

[Signed] Secretary of the Central Committee of the Communist Party of the Ukraine V. Shcherbitskiy

Deputy Chairman of the Ukrainian SSR Council of Ministers Ye. Kachalovskiy

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Nominations for 1988 Lenin Prizes in Science, Technology

18140185 Moscow IZVESTIYA in Russian 21 Jan 88 p 6

[Article: "From the Committee for Lenin and USSR State Prizes in Science and Technology Attached to the USSR Council of Ministers"]

[Text] The Committee for Lenin and USSR State Prizes in Science and Technology attached to the USSR Council of Ministers reports that the following works have been permitted to participate in the competition for the 1988 Lenin Prizes:

1. G.A. Askaryan, V.V. Korobkin, V.N. Lugovoy, N.F. Pilipetskiy, V.I. Talanov. "The Effects of the Self-Focusing of Wave Beams—Discovery and Study." (A series of works.)

Submitted by the Institute of General Physics of the USSR Academy of Sciences and the Institute of Applied Physics of the USSR Academy of Sciences.

2. A.M. Baldin, P.N. Bogolyubov, V.A. Matveyev, R.M. Muradyan, A.N. Tavkhelidze. "A New Quantum Number—Color and the Establishment of Dynamic Laws in the Quark Structure of Elementary Particles and Atomic Nuclei." (A series of works.)

Submitted by the Institute of Nuclear Research of the USSR Academy of Sciences.

3. A.Z. Dolginov, L.I. Dorman, G.F. Krymskiy, A.I. Kuzmin, I.N. Toptygin, Ye.L. Feynberg. "The Probing of Space Through Planetary Observations of Variations of Cosmic Rays: The Methods, Mechanisms of Variations, the Theory of the Propagation and Acceleration of Energy Particles in the Heliosphere." (A series of works.)

Submitted by the Institute of Terrestrial Magnetism, Ionosphere, and Radio Wave Propagation of the USSR Academy of Sciences and Leningrad Polytechnical Institute imeni M.I. Kalinin.

4. V.A. Teplyakov, I.M. Kapchinskiy, A.P. Maltsev, I.G. Maltsev, V.V. Nizhegorodtsev, V.B. Stepanov. "The Development and Production of a Linear Ion Accelerator of a New Type With the Focusing of the Beam by a Quadrupolar High Frequency Field." (A series of works.)

Submitted by the Institute of High Energy Physics.

5. F.I. Fedorov, B.V. Bokut, A.N. Serdyukov. "The Electrodynamics of Hypotropic Media." (A series of works.)

Submitted by the Institute of Physics of the Belorussian SSR Academy of Sciences.

6. L.D. Faddeyev. "A Series of Works on Current Problems of Mathematical Physics."

Submitted by the Institute of Mathematics imeni V.A. Steklov of the USSR Academy of Sciences.

7. M.V. Volkenshteyn. "The Conformational Theory of Macromolecules." (A series of works.)

Submitted by the Institute of Molecular Biology of the USSR Academy of Sciences.

8. N.K. Kochetkov. "The Synthesis and Structure of Carbohydrates." (A series of works.)

Submitted by the Institute of Organic Chemistry imeni N.D. Zelinskiy of the USSR Academy of Sciences.

9. Yu.A. Kosygin. "Tektonika" [Tectonics]. (A monograph, Moscow, "Nedra", 1983.)

Submitted by the Institute of Tectonics and Geophysics of the Far Eastern Department of the USSR Academy of Sciences.

10. L.V. Krushinskiy. "Biologicheskiye osnovy rassudochnoy deyatelnosti (evolyutsionnyy i fizilogo-geneticheskiy aspekty povedeniya)" [The Biological Foundations of Reasoning Activity (The Evolutionary and Physiological Genetic Aspects of Behavior)]. (A monograph, Moscow, "Moskovskiy universitet", 1986.)

Submitted by the Biology Faculty of Moscow State University imeni M.V. Lomonosov.

11. T.V. Gamkrelidze, V.V. Ivanov. "Indoyevropeyskiy yazyk i indoyevropeytsy. Rekonstruktsiya i istoriko-tipologicheskiy analiz prayazyka i protokultury" [The Indo-European Language and Indo-Europeans. The Reconstruction and Historical Typological Analysis of the Parent Language and Protoculture]. (A monograph in two volumes, "Tbilisskiy universitet", 1984.)

Submitted by the Institute of Oriental Studies imeni G.V. Tsereteli of the Georgian SSR Academy of Sciences.

12. B.A. Galyan, N.P. Dragunov, A.V. Lukin, A.A. Toldin, V.I. Khomenko. "The Development of a Highly Productive Technology and a Set of Equipment for the Resistance Welding of Large-Diameter Pipeline Systems."

Submitted by the Institute of Electric Welding imeni Ye.O. Paton of the Ukrainian SSR Academy of Sciences.

13. A.A. Voronov. "A Series of Works on the Formation of a Scientific Discipline—The Modern General Theory of Automatic Control."

Submitted by the All-Union Scientific Research Institute of Systems Research of the USSR Academy of Sciences.

The names of the works and the collectives of authors are published in conformity with the submission, without changes.

In publishing the list of the 13 works, which have been permitted to participate in the competition, the committee addresses the request to scientific production associations, enterprises, scientific institutions, higher educational institutions, scientific and technical societies, scientists and specialists, and the public at large to report their opinion on the works and the collectives of authors.

It is possible to obtain information on the location of the holding of a public discussion of each work, which is being organized by the committee, by calling 250-38-08, 250-19-47, and 250-37-14.

All opinions, the materials of discussions, and the remarks on the works and collectives of authors should be sent to the committee by 20 February of this year at the address: 125047, Moscow, A-47, 3-ya Tverskaya-Yamskaya Ulitsa, dom 46.

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Kargin Prize Awarded to Polymer Chemists

18140149c Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 12, Dec 87 pp 120-121

[Article under the rubric "News Items and Information": "The V.A. Kargin Prize to N.F. Bakeyev, A.L. Volynskiy, Ye.A. Sinevich"]

[Text] The Presidium of the USSR Academy of Sciences has awarded the 1987 V.A. Kargin Prize to Doctor of Chemical Sciences Nikolay Filippovich Bakeyev (the Scientific Research Institute of Physical Chemistry imeni L.Ya. Karpov), Doctor of Chemical Sciences Aleksandr Lvovich Volynskiy (Moscow State University imeni M.V. Lomonosov), and Candidate of Chemical Sciences Yevgeniy Anatolyevich Sinevich (the Scientific Research Institute of Physical Chemistry imeni L.Ya. Karpov) for the series of works "The Mechanism of the Deformation and the Structure and Properties of Polymers Which Have Been Cold Drafted in Liquid Media."

The basic achievements of the authors on the study of the basic principles of the cold draft of polymers and the effect of the media on the processes of inelastic deformation and the structure and properties of polymers, which have been deformed in liquid media, are generalized in the series of works, which was awarded the prize. One of the main directions of this series of studies is the most general laws of the mechanism of the deformation of polymers in liquid media. On the basis of the established laws the peculiarities of the manifestation of the Rebinder effect in polymers were formulated.

The most promising result, which was obtained by the authors, is the discovery of a new structural physics state of polymers. Its main peculiarity is the presence of a highly developed interface. It was shown that materials, which have been obtained on the basis of such polymers, acquire a large number of previously unknown physical mechanical, physical chemical, thermoelastic, and other properties. The appearance of a set of new properties in these materials was explained from a common standpoint with the enlistment of ideas about the surface phenomena on highly developed interfaces, which are characteristic of such systems.

The authors examined in detail the conditions of the transition of polymers into a highly dispersed oriented state. Theoretical ideas, which make it possible to predict the basic measurable parameters of such a transition, were developed. The scientific and applied significance of the obtained results was shown.

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Zelinskiy Prize Awarded to Three Chemists

18140149b Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 12, Dec 87 pp 119-120

[Article under the rubric "News Items and Information": "The N.D. Zelinskiy Prize to Kh.M. Minachev, O.M. Nefedov, V.V. Kharlamov"]

[Text] The Presidium of the USSR Academy of Sciences has awarded the 1987 N.D. Zelinskiy Prize to Academician Khabib Minachevich Minachev, Corresponding Member of the USSR Academy of Sciences Oleg Matveyevich Nefedov, and Candidate of Chemical Sciences Vyacheslav Vasilyevich Kharlamov (the Institute of Organic Chemistry imeni N.D. Zelinskiy of the USSR Academy of Sciences) for the work "The Development of the Scientific Principles of a Technologically Feasible Method of Obtaining Allyl Acetate by the Catalytic Acetoxylation of Propylene."

The work, which was awarded the prize, is devoted to the study of the process of obtaining the base intermediate product, on the basis of which a number of valuable substances: allyl alcohol, glycerin, glycidol, epichlorohydrin, and others, are synthesized. Therefore, the elaboration of a convenient and technologically feasible method of obtaining allyl acetate and the development of highly efficient catalysts for this process are an important and urgent task.

The authors made an extensive search for the most active catalysts of the reaction of the oxidizing acetoxylation of propylene. Crystalline and amorphous aluminosilicates were used for the first time for the production of the catalysts of the indicated reaction. As a result of extensive research it was shown that the activity of catalysts based on crystalline aluminosilicates depends on the type and composition of the used zeolite, here it increases with the increase of the SiO_2/Al_2O_3 ratio and reaches the maximum value of 600-800 grams of allyl acetate per liter of catalyst an hour at a temperature of 180 degrees Celsius and atmospheric pressure for a catalyst based on zeolite like TsVM.

In case of catalysts based on amorphous aluminosilicates the activity and selectivity to a significant extent are determined by the character of the porous structure of the carrier and also depend on the method of introduction of the metal into it. Here it was established that the most active catalysts are obtained in case of the distribution of the metal on the surface layers of the grain of the carrier.

The study of the kinetics and mechanism of the reaction, including experiments with tagged acetic acid, made it possible to find the optimum conditions of the implementation of the process.

The practical significance of the results obtained in the work consists in the fact that the developed catalysts in their activity significantly surpass the ones being used at present and the ones described in the literature, therefore, their introduction in practice will make it possible to increase substantially the efficiency of the production of ally acetate—an important industrial intermediate product.

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Mechnikov Prize Awarded to I.S. Darevskiy

18140149d Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 12, Dec 87 pp 121-122

[Article under the rubric "News Items and Information": "The I.I. Mechnikov Prize to I.S. Darevskiy"]

[Text] The Presidium of the USSR Academy of Sciences has awarded the 1987 I.I. Mechnikov Prize to Doctor of Biological Sciences Ilya Sergeyevich Darevskiy (the Zoology Institute of the USSR Academy of Sciences) for the series of works "The Origin and Role in Evolution of Natural Parthenogenesis in Higher Vertebrates."

The research of the author showed for the first time that unisexual reproduction (parthenogenesis) is characteristic of such highly organized animals as reptiles. The diploid and triploid species of lizards, which were described by I.S. Darevskiy, do not have males and reproduce through cloning by obligate natural parthenogenesis. It was established by the methods of morphological, zoogeographic, biochemical, and karyological analyses that unisexual species initially formed as a result of hybridization between bisexual parental forms, and this is a vivid example of what is called "network speciation" among animals. I.S. Darevskiy analyzed in detail the morphological and biological peculiarities of the appearance of unisexual species and the specific nature of their propagation. The conclusion about their emergence in zones of extreme conditions, which give parthenospecies an advantage over ordinary forms, were convincingly argued.

The research of I.S. Darevskiy with coauthors on the adaptation of skin grafts, which made it possible to identify the individual specific nature of immune reactions, showed the great similarity in this respect of individuals from parthenogenetic populations. These data indicate their origin from one or several females. The high fixed heterozygosity of parthenospecies, which was established with respect to the polymorphism of a number of proteins, is regarded as a consequence of the hybrid origin of these species. Results, which objectively indicate the gradual nature of the formation of hybrid parthenospecies, were obtained.

The research of I.S. Darevskiy has contributed significantly to the formation of the present notions about the role of hybridization, parthenogenesis, and polyploidy in the evolution of vertebrates and has been included in the international basis 15-volume handbook "Biology of the Reptilia."

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Chemists Share Mendeleyev Prize

18140149a Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 12, Dec 87 pp 118-119

[Article under the rubric "News Items and Information": "The D.I. Mendeleyev Prize to V.L. Kuchayev, L.M. Nikitushina, M.I. Temkin"]

[Text] The Presidium of the USSR Academy of Sciences has awarded the 1987 D.I. Mendeleyev Prize to Candidate of Chemical Sciences Vadim Leonidovich Kuchayev, Candidate of Chemical Sciences Lyudmila Mikhaylovna Nikitushina, and Doctor of Chemical Sciences Menassiy (Mikhail) Isaakovich Temkin (the Scientific Research Institute of Physical Chemistry imeni L.Ya. Karpov) for the work "The Mechanisms of the Oxidation of Gases by Molecular Oxygen and Nitrogen Monoxide on Platinum in Their Interaction."

The work, which was awarded the prize, creates the scientific foundations of the industrially important processes of catalytic oxidation on platinum. The study of the fast processes of the oxidation of gases was carried out with the use of secondary ion-ion emission from a catalyst during reaction and various isotopes as tagged atoms and the study of the kinetics of reactions in case of their separate and joint occurrence. As a result the general laws of oxidation on platinum were revealed and the specific mechanisms of each of the studied reactions were established. Among them are reactions which are used extensively in technology: the oxidation of ammonia into nitrogen monoxide, which is the basis for the production of nitric acid and is used in the obtaining of caprolactam, the reactions in case of the neutralization of the exhaust of internal combustion engines and in case of the elimination of the products of the operation of gas lasers and atomic power plants.

The work provides an answer to a number of fundamental questions, which arise in the practical implementation of the mentioned processes, and reveals the prospects of their improvement. The authors established the means of the formation of nitrogen monoxide and the unfixing of nitrogen in case of the industrial oxidation of ammonia and explained the necessity of an excess of oxygen and the carrying out of the process in the outside diffusion region for the achievement of high selectivity.

The nature of the inhibiting effect of oxygen on the reaction of the reduction of nitrogen monoxide by carbon monoxide was also clarified. These results were used in the development of a bifunctional catalyst, that is, one which eliminates both carbon monoxide and nitrogen monoxide, of the neutralization of the exhaust of internal combustion engines. The results obtained by the authors also contributed to the completion at the Institute of Physical Chemistry imeni L.Ya. Karpov of a number of other applied developments, which at present have been introduced in practice.

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Miklukho-Maklay Prize Awarded to N.A. Butinov

18140149e Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 12, Dec 87 pp 122-123

[Article under the rubric "News Items and Information": "The N.N. Miklukho-Maklay Prize to N.A. Butinov"]

[Text] The Presidium of the USSR Academy of Sciences has awarded the 1987 N.N. Miklukho-Maklay Prize to Doctor of Historical Sciences Nikolay Aleksandrovich Butinov (the Leningrad Branch of the Institute of ethnography imeni N.N. Miklukho-Maklay) for the series of works "Papuasy Novoy Gvinei" [The Papuans of New Guinea], "Polineziytsy ostrovov Tuvalu" [The Polynesians of the Tuvalu Islands], and "Sotsialnaya organizatsiya polinesiytsev" [The Social Organization of Polynesians].

N.A. Butinov is a well-known specialist in the field of the ethnography of Oceania and the author of about 150 works (of them 5 are books), which are devoted to various little studied problems of the economy, daily life, cultural, social kinship relations, ethnic composition, and languages of individual areas of the Oceania area.

The books of N.A. Butinov, which were commended by the prize, had great repercussions in science. All of them are the first monographic studies in domestic science and for the present the only ones on the themes, which are specified in their titles. The problems of the social

system of the peoples of Oceania are studied by the author on extensive material, including the material obtained by himself during a scientific expedition to Oceania.

In his monographs the scientist poses a number of fundamentally important problems which pertain to the sphere of the science of primitive society as a whole. Thus, he proposed a version of the solution of the problem of exogamy. He was the first to voice the opinion that the paternal clan might also originate at early stages of the primitive formation, and in this connection proposed to differentiate the early and late paternal clan. The scientist advanced the idea of the commune as the basic social unit of the primitive state and examined in a new way the relationship of the clan and the commune in antiquity. Owing to the works of N.A. Butinov the point of view of the commune as the primary social organism under the conditions of the communal paternal system became widespread in Soviet ethnography.

Another important peculiarity of the scientific works of N.A. Butinov is the attention to foreign ethnography and the critical evaluation of the views of both its individual representatives and entire schools and directions. The constant turning to the works of N.N. Miklukho-Maklay, the creative interpretation of the heritage of the Russian scientist, and its evaluation, which is based on many years of his own experience of studying the economy, culture, daily life, and social organization of the peoples of Oceania, are a characteristic trait of the works of the researcher.

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World Meteorological Organization Prize Awarded to M.I. Budyko

18140149f Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 12, Dec 87 p 123

[Article under the rubric "News Items and Information": "The Awarding of the Scientific Decoration of the World Meteorological Organization to Corresponding Member of the USSR Academy of Sciences M.I. Budyko"]

[Text] The World Meteorological Organization has awarded the 1987 gold medal and prize for outstanding scientific services in the field of meteorology to Corresponding Member of the USSR Academy of Sciences Mikhail Ivanovich Budyko, chief of the Department of the Study of Climate Changes of the State Hydrology Institute, for works on the problem of the anthropogenic modification of the climate.

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Winners of 1987 USSR State Prizes in Science, Technology

18140198 Moscow IZVESTIYA in Russian 7 Nov 87 pp 1-2

[Decree of the CPSU Central Committee and the USSR Council of Ministers "On the Awarding of the 1987 USSR State Prizes in Science and Technology"]

[Text] Having considered the suggestion of the Committee for Lenin and USSR State Prizes in Science and Technology attached to the USSR Council of Ministers, the CPSU Central Committee and the USSR Council of Ministers resolve:

To award the 1987 USSR State Prizes to:

I. In Science

1. Doctors of Physical Mathematical Sciences Yuriy Mironovich Aliyev and Leonid Mikhaylovich Gorbunov, senior scientific associates of the Physics Institute imeni P.N. Lebedev of the USSR Academy of Sciences; Doctor of Physical Mathematical Sciences Viktor Pavlovich Silin, head of a sector of the same institute; Doctor of Physical Mathematical Sciences Vladimir Borisovich Gildenberg, professor of Gorkiy State University imeni N.I. Lobachevskiy; Corresponding Member of the USSR Academy of Sciences Vladimir Yevgenyevich Zakharov, head of a sector of the Institute of Theoretical Physics imeni L.D. Landau of the USSR Academy of Sciences; Doctor of Physical Mathematical Sciences Aleksandr Grigoryevich Litvak, head of a laboratory of the Institute of Applied Physics of the USSR Academy of Sciences; Doctor of Physical Mathematical Sciences Mikhail Adolfovich Miller, head of a department of the same institute; Doctor of Physical Mathematical Sciences Viktor Nikolayevich Orayevskiy, head of a department of the Institute of Terrestrial Magnetism, Ionosphere, and Radio Wave Propagation of the USSR Academy of Sciences; Doctor of Physical Mathematical Sciences Valentin Ivanovich Shevchenko, deputy director of the Institute of Space Research of the USSR Academy of Sciences; Doctor of Physical Mathematical Sciences Semen Samoylovich Moiseyev, head of a department, and Doctor of Physical Mathematical Sciences Vitaliy Donovich Shapiro, head of a laboratory, staff members of the same institute; Doctor of Physical Mathematical Sciences Leonid Ivanovich Rudakov, chief of a department of the Institute of Atomic Energy imeni I.V. Kurchatov—for the series of works "The Fundamentals of the Nonlinear Dynamics of High Frequency Wave Processes in Completely Ionized Plasma," which were published during 1958-1985.

2. Candidate of Physical Mathematical Sciences Aleksandr Aleksandrovich Andronov, head of a laboratory of the Institute of Applied Physics of the USSR Academy of Sciences; Candidate of Physical Mathematical Sciences Avenir Mikhaylovich Belyantsev, head of a departmen...

and Candidates of Physical Mathematical Sciences Vladimir Izyaslavovich Gavrilenko, Vladimir Anatolyevich Kozlov, Zakhariy Fishelevich Krasilnik, and Valeriy Nikolayevich Shastin, senior scientific associates, workers of the same institute; Doctor of Physical Mathematical Sciences Leonid Yevgenyevich Vorobyev, professor of Leningrad Polytechnical Institute imeni M.I. Kalinin; Doctor of Physical Mathematical Sciences Yuriy Leonidovich Ivanov, senior scientific associate of the Physical Technical Institute imeni A.F. Ioffe of the USSR Academy of Sciences; Doctor of Physical Mathematical Sciences Ioshua Benyaminovich Levinson, head of a department of the Institute of Problems of Technology of Microelectronics and Ultrafine Materials of the USSR Academy of Sciences; Doctor of Physical Mathematical Sciences Vladimir Nikolayevich Murzin, chief scientific associate of the Physics Institute imeni P.N. Lebedev of the USSR Academy of Sciences; Candidate of Physical Mathematical Sciences Yevgeniy Viktorovich Starikov, senior scientific associate of the Institute of Semiconductor Physics of the Lithuanian SSR Academy of Sciences; Candidate of Physical Mathematical Sciences Pavel Nikolayevich Shiktorov, scientific associate of the same institute—for the series of works "Inverted Distributions of Hot Charge Carriers and the Generation of Stimulated Radiation in Semiconductors in the Millimeter, Submillimeter, and Far Infrared Bands," which were published during 1966-1985.

3. Doctor of Physical Mathematical Sciences Igor Vsevolodovich Grekhov, head of a laboratory of the Physical Technical Institute imeni A.F. Ioffe of the USSR Academy of Sciences, supervisor of the work; Candidates of Physical Mathematical Sciences Andrey Vasilyevich Gorbatyuk, Aleksey Fedorovich Kardo-Sysoyev, and Lyudmila Serafimovna Kostina and Candidate of Technical Sciences Nikolay Stepanovich Yakovchuk, senior scientific associates, Candidate of Physical Mathematical Sciences Sergey Vladimirovich Shenderey and Candidate of Technical Sciences Sergey Vladimirovich Korotkov, scientific associates, workers of the same institute; Vladimir Aleksandrovich Fogel, chief of a department of the Leningrad Svetlana Association of Electronic Instrument Making; Mikhail Leonidovich Yefremov, chief of a division of the same association; Vladimir Pavlovich Goncharenko, chief of a laboratory of the Scientific Research Institute of Electrophysical Apparatus imeni D.V. Yefremov; Candidate of Technical Sciences Viktor Leonidovich Kuzmin, chief of a design bureau of the Tallinskiy elektrotekhnicheskiy zavod imeni M.I. Kalinina Production Association; Nikolay Ivanovich Klochkov, chief of a department of a scientific research institute—for the development of new principles of the switching of high powers by semiconductor instruments.

4. Academician Vasiliy Sergeyevich Vladimirov, deputy director of the Mathematics Institute imnei V.A. Steklov of the USSR Academy of Sciences; Doctors of Physical Mathematical Sciences Tatanya Anatolyevna Germogenova and Vladimir Yakovlevich Goldin, heads of sectors of the Institute of Applied Mathematics imeni M.V. Keldysh of the USSR Academy of Sciences; Doctor of Physical Mathematical Sciences Mikhail Valeryanovich Maslennikov, head of a department of the same institute; Doctor of Physical Mathematical Sciences Vyacheslav Ivanovich Lebedev, chief of a laboratory of the Institute of Atomic Energy imeni I.V. Kurchatov; Doctor of Physical Mathematical Sciences Sergey Borisovich Shikhov, professor of the Moscow Institute of Engineering Physics; Academician of the Kazakh SSR Academy of Sciences Umirzak Makhmutovich Sultangazin, director of the Institute of Mathematics and Mechanics of the Kazakh SSR Academy of Sciences—for the series of works "The Development of Mathematical Methods of the Theory of Particle Transfer," which were published during 1958-1983.

5. Academician Mikhail Mikhaylovich Lavrentyev, head of a department of the Computer Center of the Siberian Department of the USSR Academy of Sciences, supervisor of the work; Doctors of Physical Mathematical Sciences Yuriy Yevgenyevich Anikonov, Valeriy Rashidovich Kireytov, and Vladimir Gavrilovich Romanov, heads of laboratories of the same computer center; Candidate of Physical Mathematical Sciences Sergey Petrovich Shishatskiy—for the series of works "Inverse and Incorrect Problems of Mathematical Physics and Analysis," which were published during 1978-1984.

6. Corresponding Member of the USSR Academy of Sciences Lev Vasilyevich Ovsyannikov, head of a laboratory of the Institute of Hydrodynamics of the Siberian Department of the USSR Academy of Sciences; Doctor of Physical Mathematical Sciences Nail Khayrullovich Ibragimov, leading scientific associate of the Institute of Applied Mathematics imeni M.V. Keldysh of the USSR Academy of Sciences—for the series of works "The Grouped Analysis of Differential Equations: The General Theory and Applications in Mathematical Physics," which were published during 1978-1983.

7. Corresponding Member of the USSR Academy of Sciences Gennadiy Alekseyevich Krestov, director of the Institute of Chemistry of Nonaqueous Solutions of the USSR Academy of Sciences, supervisor of the work; Doctor of Chemical Sciences Yuriy Mikhaylovich Kessler and Candidate of Chemical Sciences Vladimir Nikolayevich Afanasyev, heads of laboratories, Doctor of Chemical Sciences Boris Dmitriyevich Berezin, head of a department, staff members of the same institute; Doctor of Chemical Sciences Aleksandr Ivanovich Konovalov, head of a chair of Kazan State University imeni V.I. Ulyanov-Lenin; Doctors of Technical Sciences Boris Nikolayevich Melnikov and Yevgeniy Mikhaylovich Rumyantsev, heads of chairs of the Ivanovo Institute of Chemical Technology; Doctor of Chemical Sciences Natalya Aleksandrovna Smirnova, professor of Leningrad State University imeni A.A. Zhdanov; Doctor of Chemical Sciences Aleksey Georgiyevich Morachevskiy, head of a laboratory of the scientific research Institute of Chemistry of the same university; Doctor of

Chemical Sciences Yuriy Yakovlevich Fialkov, head of a chair of Kiev Polytechnical Institute imeni 50-letiya Velikoy Oktyabrskoy sotsialisticheskoy revolyutsii—for the series of work "The Development of Theoretical Principles of the Chemistry of Nonaqueous Solutions and Their Practical Use," which were published during 1962-1985.

8. Doctor of Chemical Sciences Vsevolod Borisovich Ufimtsev and Doctor of Physical Mathematical Sciences Viktor Ilich Fistul, heads of chairs of the Moscow Institute of Fine Chemical Technology imeni M.V. Lomonosov; Candidate of Technical Sciences Rauf Khamzinovich Akchurin, docent of the same institute; Doctor of Technical Sciences Vladimir Borisovich Osvenskiy, head of a laboratory of the State Scientific Research and Planning Institute of the Rare Metal Industry; Candidate of Physical Mathematical Sciences Yelena Viktorovna Solovyeva, senior scientific associate of the same institute; Doctor of Physical Mathematical Sciences Yuriy Vasilyevich Shmartsev, head of a laboratory of the Physical Technical Institute imeni A.F. Ioffe of the USSR Academy of Sciences; Candidate of Physical Mathematical Sciences Yuriy Fedorovich Biryulin, junior scientific associate of the same institute; Doctor of Technical Sciences Yevgeniy Naumovich Vigdorovich, chief of a laboratory of a scientific research institute; candidate of technical sciences Viktor Viktorovich Selin, chief engineer of a pilot plant—for the series of works "The Physical Chemical Principles of the Isovalent Doping of Semiconductors," which were published during 1974-1985.

9. Academician Nikolay Nikitovich Puzyrev, head of a laboratory of the Institute of Geology and Geophysics imeni 60-letiya Soyuza SSR of the Siberian Department of the USSR Academy of Sciences, supervisor of the work; Candidate of Technical Sciences Konstantin Aleksandrovich Lebedev and Candidates of Geological Mineralogical Sciences Irina Romanovna Obolentseva and Askold Vsevoldovich Trigubov, heads of laboratories, Candidate of Physical Mathematical Sciences Boris Petrovich Sibiryakov, senior scientific associate, workers of the same institute; Candidate of Technical Sciences Lidiya Nikolayevna Khudobina, former senior scientific associate of the Naro-Fominsk Department of the All-Union Scientific Research Institute of Geophysical Methods of Prospecting; Candidate of Technical Sciences Leonid Yuryevich Brodov, head of a laboratory, and Tatyana Nikolayevna Kulichikhina, leading engineer, staff members of the same department; Candidate of Technical Sciences Gennadiy Vasilyevich Vedernikov, chief geologist of the Sibneftegeofizika State Production Geophysical Trust; Candidate of Physical Mathematical Sciences Natalya Ivanovna Berdennikova; Candidate of Geological Mineralogical Sciences Artem Pavlovich Volin—for the series of works "The Physical Geological Principles of Multiwave Seismic Prospecting," which were published during 1962-1985.

10. Corresponding Member of the USSR Academy of Sciences Viktor Yefimovich Khain, professor of Moscow State Unversity imeni M.V. Lomonosov—for the monograph "Regionalnaya geotektonika" [Regional Geotectonics] in five volumes, which was published during 1971-1985.

11. Academician Yulian Vladimirovich Bromley, director of the Institute of Ethnography imeni N.N. Miklukho-Maklay of the USSR Academy of Sciences, supervisor of the work; Doctor of Geographical Sciences Solomon Ilich Bruk, deputy director, Doctor of Historical Sciences Pavel Ivanovich Puchkov, chief scientific associate, workers of the same institute; Candidate of Geographical Sciences Mikhail Borisovich Gornung, former head of a laboratory of the Institute of Geography of the USSR Academy of Sciences; Doctor of Geographical Sciences Georgiy Mikhaylovich Lappo, head of a department, Doctor of Geographical Sciences Yakov Grigoryevich Mashbits, chief scientific associate, workers of the same institute; Corresponding Member of the USSR Academy of Sciences Viktor Vatslavovich Volskiy, director of the Institute of Latin America of the USSR Academy of Sciences; Corresponding Member of the USSR Academy of Pedagogical Sciences Vladimir Pavlovich Maksakovskiy, head of a chair of the Moscow State Pedagogical Institute imeni V.I. Lenin; Doctor of Historical Sciences Sergey Aleksandrovich Tokarev—for the two-volume work "Strany i narody" [Countries and Peoples], which was published during 1978-1985.

12. Corresponding Member of the USSR Academy of Sciences Viktor Abramovich Kovda, head of a laboratory of the Institute of Soil Science and Photosynthesis of the USSR Academy of Sciences, supervisor of the work; Doctor of Agricultural Sciences Yelena Vsevolodovna Lobova, consultant of the same institute; Corresponding Member of the USSR Academy of Sciences Gleb Vsevolodovich Dobrovolskiy, Doctor of Biological Sciences Boris Georgiyevich Rozanov, heads of chairs of Moscow State University imeni M.V. Lomonosov; Doctor of Geographical Sciences Mariya Alfredovna Glazovskaya, consultant, Doctor of Biological Sciences Yelena Maksimovna Samoylova, professor, Doctor of Biological Sciences Vera Dmitriyevna Vasilyevskaya, senior scientific associate, Candidate of Biological Sciences Marina Nikolayevna Stroganova, docent, staff members of the same university; Candidate of Biological Sciences Aleksandr Vladimirovich Khabarov, senior scientific associate of the State Scientific Research Institute of Land Resources; Doctor of Geographical Sciences Nikolay Nikolayevich Rozov—for the series of works "Soils of the World: Cartography, Genesis, Resources, Assimilation," which were published during 1965-1985.

13. Doctor of Geological Mineralogical Sciences Boris Aleksandrovich Savelyev, senior scientific associate of the Production Scientific Research Institute for Engineering Surveying in Construction—for the series of works "The Structure, Physics, Chemistry, and Mechanics of Natural Ices," which were published during 1971-1985.

14. Academician of the USSR Academy of Medical Sciences Petr Dmitriyevich Gorizontov, former head of a laboratory of the Institute of Biophysics; Corresponding Member of the USSR Academy of Medical Sciences Yevgeniy Fedorovich Romantsev, senior scientific associate-consultant, Doctors of Biological Sciences Viktor Konstantinovich Mazurik and Igor Vladimirovich Filippovich, heads of laboratories, Candidate of Biological Sciences Natalya Vladimirovna Yermolayeva, senior scientific associate, workers of the same institute; Doctor of Medical Sciences Yevgeniy Aleksandrovich Zherbin, director of the Central Scientific Research Institute of Roentgenology and Radiology; Doctor of Medical Sciences Kaydo Paulovich Khanson, head of a department, Candidate of Biological Sciences Boris Davidovich Zhivotovskiy, senior scientific associate, workers of the same institute; Corresponding Member of the USSR Academy of Sciences Aleksandr Mikhaylovich Kuzin, head of a department of the Institute of Biological Physics of the USSR Academy of Sciences; Doctor of Biological Sciences Samuil Rafailovich Umanskiy, head of a laboratory of the same institute; Doctor of Biological Sciences Aleksandr Mikhaylovich Poverennyy, head of a department of the Scientific Research Institute of Medical Radiology of the USSR Academy of Medical Sciences; Doctor of Biological Sciences Nikolay Ilich Ryabchenko, head of a laboratory of the same institute—for the development of the theoretical principles of the radiation death of lymphoid cells and their use for the clarification of the pathogenesis of radiation sickness.

15. Doctor of Biological Sciences Georgiy Aleksandrovich Mazokhin-Porshnyakov, head of a chair of Moscow State University imeni M.V. Lomonosov, supervisor of the work; Doctor of Biological Sciences Rustem Devletovich Zhantiyev, professor of the same university; Corresponding Member of the USSR Academy of Sciences Vladimir Leonidovich Sviderskiy, director of the Institute of Evolutionary Physiology and Biochemistry imeni I.M. Sechenov of the USSR Academy of Sciences; Doctor of Biological Sciences Feliks Guryevich Gribakin, head of a laboratory, Doctor of Biological Sciences Andrey Vladimirovich Popov, leading scientific associate, workers of the same institute; Doctor of Biological Sciences Leonid Ivanovich Frantsevich, head of a department of the Institute of Zoology imeni I.I. Shmalgauzen of the Ukrainian SSR Academy of Sciences; Doctor of Biological Sciences Algirdas Vintsovich Skirkyavichyus, head of a laboratory of the Institute of Zoology and Parasitology of the Lithuanian SSR Academy of Sciences; Candidate of Biological Sciences Yuriy Aleksandrovich Yelizarov—for the series of works "The Physiology of the Sense Organs of Insects," which were published during 1965-1985.

16. Corresponding Member of the USSR Academy of Sciences Pavel Vasilyevich Simonov, director of the Institute of Higher Nervous Activity and Neurophysiology of the USSR Academy of Sciences; Academician of the USSR Academy of Medical Sciences Vladimir Sergeyevich Rusinov, deputy director, Doctor of Biological Sciences Mikhail Vasilyevich Frolov, head of a laboratory, Doctor of Biological Sciences Galina Nikolayevna Boldyreva, chief scientific associate, Doctor of Medical Sciences Nina Yevgenyevna Sviderskaya and Candidate of Technical Sciences Vladimir Georgiyevich Volkov, leading scientific associates, Doctor of Biological Sciences Tatyana Aleksandrovna Korolkova, scientific consultant, staff members of the same institute; Candidate of Technical Sciences Yelena Makarovna Vakar, former senior scientific associate of the same institute; Doctor of Biological Sciences Olga Mikhaylovna Grindel, senior scientific associate of the Scientific Research Institute of Neurosurgery imeni N.N. Budrenko of the USSR Academy of Medical Sciences; Academician Mikhail Nikolayevich Livanov; Doctor of Biological Sciences Varvara Yevstafyevna Mayorchik—for the development and application of methods of the diagnosis and preventive treatment of the functional state of the human brain.

17. Doctor of Historical Sciences Magomed Abdul-Kadyrovich Dandamayev, chief of a sector of the Leningrad Department of the Institute of Oriental Studies of the USSR Academy of Sciences—for the series of works "The Socioeconomic and Political History of Iran and Mesopotamia," which were published during 1963-1985.

18. Academician Yevgeniy Mikhaylovich Zhukov, supervisor of the work; Doctor of Historical Sciences Nikolay Matveyevich Lavrov, head of a sector, Doctors of Historical Sciences Robert Fedorovich Ivanov and Yelena Mikhaylovna Shtayerman, leading scientific associates, workers of the Institute of General History of the USSR Academy of Sciences; Corresponding Member of the USSR Academy of Sciences Yuriy Aleksandrovich Polyakov, head of a sector of the Institute of History of the USSR of the USSR Academy of Sciences; Corresponding Member of the USSR Academy of Sciences Viktor Ivanovich Rutenburg, head of a department of the Leningrad Department of the same institute; Corresponding Member of the USSR Academy of Sciences Yuriy Alekseyevich Pisarev, head of a sector of the Institute of Slavic and Balkan Studies of the USSR Academy of Sciences; Doctor of Historical Sciences Aleksandr Yakovlevich Manusevich, leading scientific associate-consultant of the same institute; Corresponding Member of the USSR Academy of Sciences Zinaida Vladimirovna Udaltsova—for the 13-volume work "Vsemirnaya istoriya" [World History], which was published during 1955-1983.

19. Corresponding Member of the USSR Academy of Sciences Grigoriy Ivanovich Tunkin, head of a chair of Moscow State University imeni M.V. Lomonosov—for the series of works "Problems of the Theory of International Law," which were published during 1962-1983.

20. Academician of the USSR Academy of Medical Sciences Andrey Ivanovich Vorobyev, head of a chair of the Central Institute of the Advanced Training of Physicians, supervisor of the work; Doctor of Medical Sciences Mikhail Gukasovich Abramov, professor, Doctor

of Medical Sciences Natalya Yevgenyevna Andreyeva, docent, Doctor of Medical Sciences Lev Iosifovich Idelson, senior scientific associate, Candidate of Medical Sciences Marina Davydovna Brilliant, junior scientific associate, workers of the same institute; Doctor of Medical Sciences Fedor Nikolayevich Romashov, head of a chair of the University of Friendship of Peoples imeni Patrice Lumumba; Doctor of Medical Sciences Andrey Valeryevich Butrov, professor of the same university; Doctor of Medical Sciences Zinoviy Solomonovich Barkagan, head of a chair of the Altay Medical Institute imeni Leninskogo komsomola; Doctor of Medical Sciences Sergey Konstantinovich Ternovoy, head of a department of the Central Clinical Hospital of the Fourth Main Administration attached to the USSR Ministry of Health; Doctor of Medical Sciences Yelena Viktorovna Chernokhvostova, head of a laboratory of the Moscow Scientific Research Institute of Epidemiology and Microbiology imeni G.N. Gabrichevskiy; Candidates of Medical Sciences Vladimir Matveyevich Gorodetskiy and Georgiy Petrovich Ilin, heads of departments of Central Clinical Hospital No 2—for the series of works "New Methods of Diagnosis and Intensive Therapy in Case of Diseases of the Blood System," which were published during 1978-1985.

21. Doctor of Technical Sciences Mikhail Ivanovich Gorbunov-Posadov, senior scientific associate-consultant of the Scientific Research Institute of Foundations and Underground Structures imeni N.M. Gersevanov, supervisor of the work; Candidate of Technical Sciences Tatyana Andreyevna Malikova, senior scientific associate of the same institute; Doctor of Technical Sciences Vitaliy Ivanovich Solomin, head of a chair of Chelyabinsk Polytechnical Institute imeni Leninskogo komsomola—for the monograph "Raschet konstruktsiy na uprugom osnovanii" [The Analysis of Components on a Cushion], which was published in 1984.

II. In Technology

1. Doctor of Technical Sciences Georgiy Nikolayevich Gogonenkov, chief engineer of the Central Geophysical Expedition of the USSR Ministry of the Petroleum Institute; Doctor of Technical Sciences Aleksey Sergeyevich Kashik, chief, Candidate of Technical Sciences Vladimir Borisovich Levyant, chief geologist, Candidates of Technical Sciences Vasiliy Kharlampovich Kivelidi and Valentin Iosifovich Meshbey, chiefs of parties, Candidate of Geological Mineralogical Sciences Leonid Ivanovich Ivanov, chief geophysicist of a party, workers of the same expedition; Boris Moiseyevich Karasik, chief of a party of the Krasnodarneftegeofizika Trust; Vladimir Mikhaylovich Kashin, director of the Krasnodar Special Design and Technological Bureau of Electronic Seismic Prospecting Equipment; Vladislav Ivanovich Grigolyunas, chief of a department of the USSR Ministry of the Petroleum Industry; Doctor of Geological Sciences Jaroslav Ibrmajer, director of the Geofysika national enterprise (Brno, the CSSR); Doctor of Natural Sciences Dieter Weintritt, chief of the computer center of the VVB Geophysik (Leipzig, the GDR)—for the development and introduction of a commercial system of the processing on a Yes computer of data of the seismic prospecting of petroleum and gas deposits.

2. Yaan Aleksandrovich Allikvere, senior engineer-process engineer of the pilot plant of organic synthesis and biological preparations of the Institute of Chemistry of the Estonian SSR Academy of Sciences; Candidate of Chemical Sciences Yaan Kheymarovich Iyyers, senior scientific associate, Candidate of Technical Sciences Khelya Petrovna Urbel, senior scientific associate, Aare Voldemarovich Pyarnu, scientific associate, Virva Mikhkelevna Allikmaa, senior engineer, staff members of the same institute; Oskar Peeterovich Kuul, chairman of the board of the Reference Model Fishing Kolkhoz imeni S.M. Kirov of the Estonian Republic Union of Fishing Kolkhozes; Arvo Arturovich Uukkivi, chief designer, Arvo Adolfovich Kalyumyae, Avo Ilmarovich Poom, and Myart Arnoldovich Rebane, design engineers of category 1, Candidate of Chemical Sciences Valdek Aleksandrovich Slet, chief process engineer of a shop, workers of the same kolkhoz—for the development and introduction of a technology of the processing of the fatty waste of fish canning for the production of cosmetic detergents.

3. Georgian SSR Deputy Minister of Trade Shalva Akakiyevich Lukhutashvili; Candidate of Technical Sciences Vitaliy Vladimirovich Kvinikhidze, director of the Tbilisi Yeast Plant; Nelli Shalvovna Khutsishvili, chief engineer of the same plant; Candidate of Technical Sciences Tatyana Vladimirovna Tulyakova, head of a sector of the All-Union Scientific Research Institute of Food Biotechnology; Doctor of Technical Sciences Vilen Mikhaylovich Kantere, head of a chair of the Moscow Technological Institute of the Food Industry; Candidate of Technical Sciences Ruslan Vladimirovich Kuzminskiy, general director of the Scientific Production Association of the Baking Industry; Cheslava Adolfovna Dudchik, director of the Minsk Yeast Combine; Corresponding Member of the USSR Academy of Medical Sciences Vsevolod Ivanovich Ogarkov—for the development and industrial assimilation of a low-waste technology of the production of high-quality baking yeast.

4. Candidate of Medical Sciences Vladimir Petrovich Abeltsev, senior resident physician of the United Hospital of the Fourth Main Administration attached to the USSR Ministry of Health; Doctor of Medical Sciences Vadim Vladimirovich Azolov, director of a scientific research institute of traumatology and orthopedics; Doctors of Medical Sciences Ivan Grigoryevich Grishin and Oganes Vardanovich Oganesyan, directors of clinics of the Central Scientific Research Institute of Traumatology and Orthopedics imeni N.N. Priorov; Candidate of Medical Sciences Irina Nikolayevna Shinkarenko, consulting physician of a polyclinic of the same institute;

Doctor of Medical Sciences Vyacheslav Fedorovich Korshunov, professor of the 2d Moscow Medical Institute imeni N.I. Pirogov; Candidate of Medical Sciences Aleksandr Andreyevich Lazarev, assistant lecturer of the same institute; Academician of the Georgian SSR Academy of Sciences Otar Naskidovich Gudushauri, general director of the Scientific Pedagogical and Clinical Experimental Center of Traumatology and Orthopedics; Candidate of Medical Sciences Lamara Alekseyevna Tvaliashvili, resident physician of the same center—for the development of methods of the restoration of the function of the wrist by means of apparatus of transosseous fixation and reconstructive operations.

5. Academician of the USSR Academy of Medical Sciences Yelena Mikhaylovna Lukyanova, director of the Kiev Scientific Research Institute of Pediatrics, Obstetrics, and Gynecology imeni Hero of the Soviet Union P.M. Buyko, supervisor of the work; Candidate of Medical Sciences Aleksey Dmitriyevich Moroz, junior scientific associate of the same institute; Corresponding Member of the USSR Academy of Medical Sciences Stanislav Yakovlevich Doletskiy, head of a chair of the Central Institute of the Advanced Training of Physicians; Candidate of Medical Sciences Olga Aleksandrovna Surikova, junior scientific associate of the same institute; Corresponding Member of the USSR Academy of Medical Sciences Lyudmila Aleksandrovna Isayeva, head of a chair of the 1st Moscow Medical Institute imeni I.M. Sechenov; Doctor of Medical Sciences Yeva Vitalyevna Klimanskaya, head of a laboratory, Candidate of Medical Sciences Vitaliy Khrisanfovich Sosyura, senior scientific associate, workers of the same institute; Candidate of Medical Sciences Georgiy Borisovich Gershman, head of a department of Children's City Clinical Hospital No 3; Doctor of Medical Sciences Andrey Vladimirovich Mazurin, head of a chair of the 2d Moscow Medical Institute imeni N.I. Pirogov; Candidate of Medical Sciences Svetlana Semenovna Mostova, senior scientific associate of the same institute; Doctor of Medical Sciences Vladimir Pavlovich Strekalovskiy, head of a department of a scientific research institute of proctology; Candidate of Medical Sciences Anatoliy Ivanovich Volkov, director of the Gorkiy Scientific Research Institute of Pediatrics—for the development and introduction in clinical and out patient practice of endoscopic methods of the diagnosis and treatment of diseases of the respiratory and digestive organs of children.

6. Doctor of Medical Sciences Valentin Sergeyevich Mayat, consultant of the Fourth Main Administration attached to the USSR Ministry of Health; Doctor of Medical Sciences Yuriy Mikhaylovich Pantsyrev, head of a chair of the 2d Moscow Medical Institute imeni N.I. Pirogov; Doctors of Medical Sciences Anatoliy Alekseyevich Kurygin and Anatoliy Ivanovich Nechay, chiefs of departments of the Military Medical Academy imeni S.M. Kirov; Doctor of Medical Sciences Valentin Mikhaylovich Sitenko, professor of the same academy; Doctor of Medical Sciences Petr Moiseyevich Postolov, head of a chair of the Volgograd Medical Institute; Candidate of Medical Sciences Nikolay Mikhaylovich Kuzin, docent of the 1st Moscow Medical Institute imeni I.M. Sechenov; Doctor of Medical Sciences Vadim Sergeyevich Pomelov, director of a department of the Institute of Surgery imeni A.V. Vishnevskiy of the USSR Academy of Medical Sciences; Doctor of Medical Sciences Aleksandr Arkadyevich Grinberg, deputy chief physician of City Clinical Hospital No 15 of the Moscow City Soviet Executive Committee; Doctor of Medical Sciences Uno Fridrikhovich Sibul, chief surgeon of the Tallinn City Health Department; Doctor of Medical Sciences Valeriy Feodosyevich Sayenko, director of a department of the Kiev Scientific Research Institute of Clinical and Experimental Surgery—for the development and introduction in clinical practice of new methods of the surgical treatment of ulcers.

7. Academician of the Estonian SSR Academy of Sciences Boris Georgiyevich Tamm, rector of Tallinn Polytechnical Institute, supervisor of the work; Corresponding Member of the Estonian SSR Academy of Sciences Enn Kharaldovich Tyugu and Candidate of Technical Sciences Yukhan Ilmarovich Pruuden, heads of departments of the Institute of Cybernetics of the Estonian SSR Academy of Sciences; Candidates of Technical Sciences Akhto Peeterovich Kalya, Mikhail Borisovich Matskin, and Aleksandr Leonidovich Shmundak and Reyn Georgiyevich Lyugas, heads of sectors, Candidate of Technical Sciences Imre Arturovich Melnikov, head of a laboratory, Candidates of Technical Sciences Milvya Iokhannesovna Kakhro, Khenn Yaanovich Saar, and Mayt Yakobovich Kharf, senior scientific associates, Niylo Voldemarovich Saard, scientific associate, workers of the same institute—for the development and introduction of a set of instrument systems of the programming of engineering and technical problems.

8. Candidate of Technical Sciences Vitaliy Mikhaylovich Meshcheryakov, general director of the Elektronika Scientific Production Association; Candidate of Physical Mathematical Sciences Ivan Yegorovich Lobov, chief engineer, Doctor of Technical Sciences Vyacheslav Yegorovich Mezhov, Anatoliy Yegorovich Koltakov, and Nikolay Leonidovich Ratmirov, chiefs of divisions, Candidate of Technical Sciences Valeriy Nikolayevich Kharin, chief of a department, workers of the same association; Valeriy Vasilyevich Vinnichenko, adjuster of radio engineering instruments and systems of a machine building plant; Vladimir Pavlovich Zuyev, chief of a department of a design bureau of machine building; Boris Nikolayevich Naumov, director of the Institute of Problems of Information Science of the USSR Academy of Sciences; Yuriy Alekseyevich Platonov, deputy chief engineer of a scientific research institute—for the development and introduction in production of standardized interactive software and hardware complexes of the Kulon family.

9. Boris Yakovlevich Goncharov, chief of a shop of the Siberian Plant of Heavy Electrical Machine Building imeni 60-letiya Soyuza SSR; Valeriy Konstantinovich

Ivanov, chief engineer, Viktor Grigoryevich Oshchepkov, chief process engineer, Grigoriy Vasilyevich Daurtsev, fitter-assembler, workers of the same plant; Konstantin Nikolayevich Maslennikov, deputy director of the Scientific Research, Planning, Design, and Technological Institute of Heavy Electrical Machine Building; Mikhail Sarpionovich Novoseltsev, Nikolay Porfiryevich Savonkin, and Igor Alekseyevich Chzhen, heads of departments, Leonid Matveyevich Cherevatskiy, deputy head of a department, Candidate of Technical Sciences Valentin Grigoryevich Syakov, head of a sector, staff members of the same institute; Candidate of Technical Sciences Vyacheslav Georgiyevich Ryazanov, head of a department of the Central Planning, Design, and Technological Bureau of Large Electrical Machines—for the development and introduction in production of the ATD-4 and ADO series of high-power induction motors.

10. Petr Filippovich Burakevich, chief of a department of the All-Union Scientific Research, Planning, and Design Institute for the Development of Gas Field Equipment; Doctor of Technical Sciences Aleksandr Ivanovich Gritsenko, general director of the Soyuzgaztekhnologiya Scientific Production Association; USSR Deputy Minister of Construction of Petroleum and Gas Industry Enterprises Vladimir Mikhaylovich Igolnikov; Samuil Moiseyevich Krayzelman, chief of a main administration of the same ministry; Candidate of Technical Sciences Vladimir Petrovich Kuramin, deputy chairman of the Bureau of the USSR Council of Ministers for the Fuel and Power Complex; Gennadiy Sergeyevich Sergeyev, chief project engineer of the Siberian Scientific Research and Planning Institute of Petroleum and Gas Field Construction; Rim Sultanovich Suleymanovich, general director of the Urengoy Production Association for Gas Recovery imeni S.A. Orudzhev; Mark Nikolayevich Sukholutskiy, manager of the Urengoygazpromstroy Trust; Yuriy Ivanovich Topchev, chief engineer of the Main Production Administration for Gas Recovery in Tyumen Oblast; Ivan Nikolayevich Ivanov, chief engineer of the Volgograd Plant of Petroleum Machine Building imeni Petrov; Candidate of Technical Sciences Aleksandr Aleksandrovich Kolesov, chief of a department of the State Institute for the Designing of Substructures and Foundations—for the elaboration and introduction of scientific and technical solutions, which ensured the rapid assimilation of the Urengoy Gas Deposit (the Senomanskiy Reservoir).

11. Gennadiy Alekseyevich Basov, deputy chief of a shop of the Cherepovets Metallurgical Combine imeni 50-letiya SSSR; Candidate of Technical Sciences Albert Nikolayevich Ivoditov, chief engineer, Candidate of Technical Sciences Leonid Ivanovich Danilov, chief mechanic, Nikolay Petrovich Vasilyev, chief of a 150 mill, workers of the same combine; Candidate of Technical Sciences Arkadiy Alekseyevich Gorbanev, head of a laboratory of an institute of ferrous metallurgy; Candidate of Technical Sciences Gleb Pavlovich Borisenko, leading scientific associate, Aleksandr Mikhaylovich Yunakov, scientific associate, workers of the same institute; Candidate of Technical Sciences Vadim Anatolyevich Kulesha, director of the Beloretsk Metallurgical Combine imeni M.I. Kalinin; Vitaliy Kuzmich Likhov, chief of a laboratory, Anatoliy Timofeyevich Filippov, deputy chief of a shop, Valeriy Nikolayevich Shlemov, leader of a brigade of electricians, workers of the same combine—for the development and introduction of a new technology of the production of high-quality wire rod.

12. Candidate of Technical Sciences Albert Borisovich Voronov, head of a department of the State Planing and Scientific Research Institute of the Nickel, Cobalt, and Tin Industry; Candidate of Technical Sciences Gennadiy Filippovich Filippov, leading scientific associate, Fridrikh Arkadyevich Pinskiy, chief mechanic of a department, Vladimir Semenovich Filippov, chief of a department, staff members of the same institute; Vladimir Igorevich Volkov, chief of an administration of the Norilsk Mining and Metallurgical Combine imeni A.P. Zavenyagin; Candidate of Technical Sciences Aleksandr Lvovich Sirkis, Vladimir Grigoryevich Popovich, and Yuriy Yakovlevich Sukhobayevskiy, chiefs of shops, Valeriy Dmitriyevich Shakhov, chief of a department, Nikolay Alekseyevich Maltsev, deputy chief of a department, workers of the same combine; Viktor Dmitriyevich Murashov, chief of the All-Union Association of the Nickel and Cobalt Industry; Candidate of Technical Sciences Vladimir Ivanovich Goryachkin, head of a laboratory of the State Scientific Research Institute of Nonferrous Metals—for the development and assimilation of an autoclave oxidation technology of the processing of pyrrhotite concentrates at the Norilsk Mining and Metallurgical Combine imeni A.P. Zavenyagin.

13. Doctor of Technical Sciences Vasiliy Aleksandrovich Gordeyev, head of a chair of the Leningrad Institute of the Textile and Light Industry imeni S.M. Kirov, supervisor of the work; Candidate of Technical Sciences Vsevolod Mitrofanovich Beltsov, professor, Doctor of Technical Sciences Vladimir Gennadyevich Tiranov, head of a chair, Candidate of Technical Sciences Marianna Valentinovna Svyatenko, docent, staff members of the same institute; Candidate of Technical Sciences Mikhail Nikolayevich Mokeyev, chief of a laboratory of the Leningrad Curtain and Lace Production Association; Candidate of Technical Sciences Dmitriy Vasilyevich Shirokov, deputy chief of a laboratory of the same association; Candidate of Technical Sciences Viktor Vladimirovich Rodionov, chief engineer of the Leningrad Krasnaya zarya Scientific Production Association; Candidate of Technical Sciences Boris Nikolayevich Khramov, chief of a department, Valeriy Alekseyevich Fedorov, chief of a sector, workers of the same association—for the development and introduction of woven electrical wiring.

III. For Textbooks

For Higher Educational Institutions

1. Doctor of Physical Mathematical Sciences Yakov Stepanovich Bugrov, head of a chair of the Moscow

Institute of Electronic Engineering; Academician Sergey Mikhaylovich Nikolskiy, head of a department of the Mathematics Institute imeni V.A. Steklov of the USSR Academy of Sciences—for the textbook "Vysshaya matematika" [Higher Mathematics] in three volumes, which was published during 1984-1985 (2d edition).

2. Doctor of Technical Sciences Viktor Grigoryevich Voskoboynikov, deputy director of the Institute of New Metallurgical Technology of the Central Scientific Research Institute of Ferrous Metallurgy imeni I.P. Bardin; Doctor of Technical Sciences Viktor Aleksandrovich Kudrin, rector of the Moscow Evening Metallurgical Institute; Candidate of Technical Sciences Aleksey Mikhaylovich Yakushev, docent of the same institute—for the textbook "Obshchaya metallurgiya" [General Metallurgy], which was published in 1985 (4th edition).

3. Academician of the USSR Academy of Medical Sciences Vladimir Vasilyevich Kovanov, head of a chair of the 1st Moscow Medical Institute imeni I.M. Sechenov; Doctor of Medical Sciences Pavel Aleksandrovich Romanov, professor, Doctor of Medical Sciences Tamara Ivanovna Anikina, consultant, Candidate of Medical Sciences Ivan Dmitriyevich Andreyev, docent, staff members of the same institute—for the textbook "Operativnaya khirurgiya i topograficheskaya anatomiya" [Operative Surgery and Topographic Anatomy], which was published in 1985 (2d edition).

4. Doctor of Technical Sciences Yuriy Mikhaylovich Lakhtin, head of a chair of the Moscow Institute of Automobile Roads—for the textbook "Metallovedeniye i termicheskaya obrabotka metallov" [Metal Science and the Heat Treatment of Metals], which was published in 1983 (3d edition).

For Secondary Vocational and Technical Educational Institutions

Doctor of Technical Sciences Boris Ilich Cherpakov, head of a department of the Experimental Scientific Research Institute of Metal-Cutting Machine Tools; Candidate of Technical Sciences Grigoriy Mikhaylovich Godovich, head of a laboratory of the same institute; Konstantin Nikolayevich Konstantinov, head of a sector of the Moscow Special Design Bureau of Automatic Lines and Special Machine Tools; Serafim Nikolayevich Vlasov, former manager of a brigade of the same design bureau—for the textbook "Konstruktsiya, naladka i ekspluatatsiya agregatnykh stankov i avtomaticheskikh liniy" [The Design, Adjustment, and Operation of Building Block Machine Tools and Automatic Lines], which was published in 1985 (4th edition).

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Prize Committee Official Explains Procedures

18140205 Moscow IZVESTIYA in Russian 22 Jan 88 p 2

[Interview with V. Chetverikov: "Who Selects Winners and How"]

[Text]Professor V. Chetverikov, scientific secretary to the Committee on USSR Lenin and State Prizes in Science and Technology, answers questions from our correspondent Ye. Manucharova]

[Question] Vladimir Nikolayevich, yesterday we printed a list of contestants for the Lenin Prizes in Science and Technology. Everyone is acquainted with such articles, but practically no one knows how the competition itself is organized and what processes and procedures provide objectivity in evaluating the work, which must surpass world levels. Lets start from the very beginning: Who has the right to put forward work for participation in the contest?

[Answer] Organizations, large ones. Selection takes place at the first level, when work is put forward. This right is given only to the scientific research which is most prominent and best known, both nationally and world wide, to applied science organizations and to ministries.

[Question] Does this mean that, in contrast to Nobel Prize competition, here individual scientists do not have the right to enter, but only collectives can?

[Answer] Exclusively. This is written in the Statute on Prizes. Moreover, all competitors are judged by their work collectives when they put forward their work.

[Question] The work is discussed and then goes to the committee?

[Answer] Its standards are evaluated by reviews which cross examine each work. I must tell you that if there are world standards for such work, then it is impossible to hide them from the scientific public. Take, for example, the first item on the list — a discovery involving lasers. It makes it possible to transmit powerful radiation long distances without reducing the radiation flux. The foreign scientific and technical literature has many references to this basic work.

Another way of evaluating a work's class is the world market. If the United States and Canida purchase a science intensive machine from us this is good evidence that it exceeds world standards. I am talking about work number 12 on the list. This is a basically new, highly productive technology which makes it possible to weld large diameter pipes in any weather and temperature without reducing weld quality. This machine is not set up outside the pipe, but inside. For seven years the "Northerners" from the Paton Welding institute worked above and below the Arctic Circle, thoroughly testing this equipment.

[Question] However, this is working equipment! Here the determination is more trustworthy and accurate...

[Answer] You want to contrast equipment with the human sciences? I cannot agree with you on that. Look at entry 11. This is a two volume monograph of interest to philologists and historians throughout the entire world. Based on the latest data, a Georgian specialis has succeded in creating a fundamentally new theory of the origin and formation of Indo-European languages and in reconstructing Proto-Indo-European. This work has been translated into English and is being published in the United States.

The number of translations and references in world literature is one of the major indicators for making evaluations. This is taken into account by our reviewers and experts at all stages of evaluation.

[Question] Is much work rejected?

[Answer] Not too much. This year only 18 different works were put forward. The committee assigned them to their respective sections. There they underwent primary reviewing and discussion. The sections' opinions were presented to the plenum. The plenum met a few days ago, with about 100 well known scientists in our country participating. They selected 13 works for further discussion. Some of them received unanimous voice votes of approval, while others won by only one vote.

[Question] I do not see any works from the Agroprom section on the list. Were there any?

[Answer] From Uzbekistan there was a new system for preparing land for cotton. The section admitted that the work had not been extensively tested in practice and could not be recommended to the plenum. Interestingly, the researchers themselves came to the same conclusion, although somewhat later. We received a telegram withdrawing the work.

[Question] However, I suspect that nobody wants to damage relationships. This is unpleasant even to independent scientists. Therefore, it seems to me that it is easier for reviewers to approve a work than to reject it. How do you assure objectivity and the necessary levels of critical review by each expert?

[Answer] Primarily by keeping names secret. Also, the committee gives great attention to critical comments, no matter where they come from. Now, after the list has been published, the committee has turned to the scientific community with a request to thoroughly evaluate these works and report its opinion. We strictly monitor each veto.

[Question] Can one really take the secrecy of names seriously when this involves the most important researchers in the country, who usually participate in various

discussions. Doesn't such a serious matter require independent expert review which could be provided for foreign scientists working in these areas. This is how the Nobel Committee works. Isn't it worth looking at its experience?

[Answer] I don't dispute that. If among the experts there are foreign ones that would be useful. The Statute on the Lenin Prizes does not prevent us for doing that. Possibly we will do this and make mandatory the discussion of our work by foreign colleagues.

[Question] Does this mean writing a new statute?

[Answer] Life requires this.

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Geneticists Urge More Democratic Elections to Academy of Sciences

18140213 Moscow OGONEK in Russian No 50 Dec 87 p 3

[Article by A. V. Ivanov, Lenin Prize winner; V. S. Kirpichnikov, professor, doctor of biological sciences, N. I. Vavilov Prize winner; S. Ye. Mamayeva, doctor of biological sciences; Yu. Polyanskiy, correspondent member, USSR Academy of Sciences; and A. L. Yudin, doctor of biological sciences: "Democracy and Genetics"]

[Text] Not long ago central newspapers described the improper role of A. A. Zhuchenko, president of the Moldavian SSR Academy of Sciences in handling questions in the development of gardens and orchards in the republic and in environmental protection. A few days later it became known that, neglecting these articles, an expert commission at the USSR Academy of Sciences Biology Department recommended only A. A. Zhuchenko (even though there were four other candidates) for membership in the academy in the speciality of genetics. It is hard to understand the commission's motives and to agree with its complete neglect of the opinion of the overwhelming majority of geneticists in the USSR.

Our country experienced a difficult period of rule by Lysenkoists. We, geneticists of the senior generation, remember the gloomy situation in those years, the persecution and physical annihilation of talented geneticists led by Academician N. I. Vavilov, the dictatorship of the uneducated fanatic Lysenko. The destruction of scientific selection and breeding continued for many years and cost us billions. This science's rights were formally restored in 1964, but it has still not recovered from many years of being banned and persecuted. We are way behind foreign countries in various areas of genetics (and biology in general), in selection, seed growing and breeding. The main tragedy is the shortage of qualified personnel: for more than 20 years our universities and institutes did not train specialists in genetics, nor were they elected to the USSR Academy of Sciences during this time. After 1984 N. P. Dubinin, B. L. Astaurov and D. K. Belyayev became members. Unfortunately, however, only N. P. Dubinin continues to work and he is 81 years old.

One cannot site many names among the worthy candidates to the academy. First of all is V. A. Strunnikov, president of the VOGiS [All-Union Society of Genetics and Selection] imeni N. I. Vavilov, chairman of the Scientific Council on Problems of Genetics and Selection and correspondent member of the USSR Academy of Sciences. He is known for his very precise, unique research conducted on the Chinese silkworm [*Bombyx mori L.*]. He is indisputable one of the most noted breeders, the creater of excellent breeds and hybrids of silkworms. The entire world knows the chemical mutagenesis and mutagenic selection work of I. A. Rapoport, correspondent member of the USSR Academy of Sciences and Lenin Prize winner. Professor S. G. Inge-Vechtomov, a talented scientist from Leningrad and head of the USSR's best genetics department, the one at Leningrad University. He has been nominated as a candidate for correspondent member, but fully deserves to become a full member. It is impossible to put A. A. Zhuchenko in the same rank (or even near). He is unknown as a geneticist either in our country or abroad. It is impossible to explain the expert commission's decision to Soviet society or to the world scientific community.

The story of the promotion of A. A. Zhuchenko to the academy and the discrimination against such well known scientists as V. A. Strunnikov, I. A. Rapoport and S. G.. Inge-Vechtomov shows the scandalous lack of democracy in the USSR Academy of Sciences. Its anti-democratic nature is also visible in many other ways, in particular in the "closedness" of the Academy Presidium, its sections and departments. It is also difficult to get access to the academy's president, vice-president, academician-secretaries and even rank and file associates in the presidium. A vivid example of this is President G. I. Marchuk's prolonged refusal to meet with several correspondent members and professors who wanted to talk with him about urgent questions and about taking measures to overcome lagging in genetics, the foundation to all modern biology. The story of members' election is only a partial illustration of the generally unhappy situation at the USSR Academy of Sciences.

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Editors of *Vestnik* Outline Future Policy

18140159 Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 11 Nov 87 pp 3-6

[Editorial: "Tasks of *Vestnik*'"]

[Text] As in our entire society, profound changes are taking place in the USSR Academy of Sciences. They are vividly reflected by the entire course of events at the

Academy's annual General Meeting in March, which became an important landmark in restructuring the Academy's activities in the spirit of decisions by the 27th Congress and recent CPSU Central Committee Plena. The restructuring which has begin also requires a reexamination of some aspects of activities by the editorial board and the editors of official organs such as *Vestnik Akademiy Nauk SSSR*.

Before talking about the future it is useful to recall some landmarks in the more than half century of our journal. *Vestnik* has a special place among the hundreds of scientific periodicals published in our country. At its founding, the status of this new academy journal, an unusual publication for that time, was determined. In the first issue, January 1931, there was an appeal to the readers:

"Up until now none of the Academy of Sciences' periodicals have been dedicated to science planning. This gap is easily explained historically. The Academy has not given the needed scope to questions about the most advisable structure for scientific research and to the corresponding structure for scientific institutions, or to the scientific work plan and its linkage to our construction needs... *Vestnik* should, first of all, be an organ illuminating the most interesting social factors in the Academy's scientific life and its work in organizing scientific labor. However, this activity should be examined from the perspective of certain general principles which the Academy has made the basis of its internal restructuring...

"In beginning the new journal, the Academy is convinced that our country's scientific life should be structured on a new, planned socialist basis. To assist in working out this basis in science and to give specific help in socialist construction — this is the basic task of *Vestnik*.

An article by Academicians V. P. Volgin, A. F. Ioffe and S. F. Oldenburg in the first issue was dedicated to these urgent problems in organising scientific labor.

The Academy was able to give direct and perceptible assistance in developing the national economy in the beginnings of the 1930's. It intensified the study of the country's natural resources. During those years each issue had a short — one and a half to two page — report on the work of expeditions. However, from the very beginning it was obvious that these expeditions alone were not up to the task of studying the natural resources of huge, unsurveyed areas. In *Vestnik* in 1931 there was an article outlining the future path: Academician A. Ye. Fersman wrote about the need to create permanent comprehensive bases in regions where intensive economic development was intended and the need to plan the location of such bases and affiliates throughout the USSR; Academician V. L. Komarov examined the results from organizing the first stationary units and the creation of the Academy's Far Eastern base.

The Academy's transfer to direct subordination under the USSR Council of People's Commissars and its move to Moscow in 1934 increased its role as the center of leadership over science, strengthened its ties with higher state institutions and expanded its potentials. In his speech "The Academy and the Turning Point", published in 1936, Academician N. P.Gorbunov the described forthcoming period as a new stage in the Academy's life. In *Vestnik* at this time there was a sharply increased number of publications on the condition of individual areas of basic science, their results and prospects for practical use.

During the Great Patriotic War, when we ceased publishing many journals, *Vestnik* actively helped mobilize scientific efforts to repulse the aggressor.

It is very indicative that at a General meeting of the Academy, held in the heat of war (September 1943) Academician and Vice President of the USSR Academy of Sciences A. A. Baykov announced that the 1944 work plan, together with tasks in mobilizing the country's defence and for the reconstruction of the liberated areas, should also not ignore large and important long term problems, which "in the future may give us completely new and unexpected discoveries." Even in those harsh times *Vestnik* published articles on various directions in science and, in the first months of 1945, started publishing survey articles: "Basic Scientific Problems in the Next Few Years."

The Academy's development in the postwar period required further improvements in the forms and methods of its scientific and scientific-organizational work. In 1949 the Academy compiled its first special plan for the introduction of scientific work in the national economy. A report by Academician Ye. A. Chudakov published in this journal noted that the Academy was beginning a new stage in its activities which placed new obligations upon its members and associates.

With time the journal started giving more attention to specific scientific results obtained by Academy members. However, various questions in the organization of science never left its pages. Many famous scientists and organizers of science repeatedly spoke on these questions. Probably, one cannot find an important scientist and member of our academy who, at one time or another did not write an article in *Vestnik*.

The Presidium of the Academy has always given scientific-organizational questions top priority for the journal. The concentration of the journal's efforts in this direction was helped by the development of a network of good popular science journals thoroughly illuminating the basic achievements of Soviet science.

In 1976 the journal's editorial board sharply expanded coverage of questions such as increasing the efficiency of scientists' and scientific collectives' labor, the connection between basic and applied research, the introduction of scientific work, scientific cadre training and

information and material support to science. A special section "The Organization and Efficiency of Scientific Research" was set up in the journal. Over a 10 year period more than 240 articles were published in it. The journal started publishing articles and surveys on problems in the study of science and the organization of science in other countries. These surveys gave great attention to entire directions in science. Together with publications of scientific reports at the Academy Presidium, these materials on the most important scientific problems in the social, natural and technical sciences do much to define the journal. Without them it would cease to be an organizational-administrative publication.

These articles from *Vestnik* are often translated in other countries and are cited in journals such as *Sputnik*, APN Publishing House and *Nauka i Zhizn*.

In the first two issues last year, under the rubric "For the 27th CPSU Congress", the journal published a report on a meeting by scientists-activists in the Academy, dedicated to problems in scientific-technical progress, and other materials. Right after the party congress it introduced a permanent rubric "NTP [Scientific-technical progress]: Problems of Acceleration", which is now a basic rubric. When, in it, we talk about the huge "baggage" of knowledge that academy science has acquired and the methods of achieving decisive success in scientific-technical progress, we try to focus attention on those technical, economic, social and organizational difficulties which hinder acceleration.

Undoubtedly, on of the main functions of *Vestnik* and its distinguishing feature, is systematic, up to date information on the activities of the Academy's leadership organizations — its Presidium and General Meeting. General Meeting sessions were always big events in the life of Soviet science. Now, during the restructuring which has begun in the Academy, and in conditions of widespread glasnost, these functions are especially important. However, it is insufficient to simply inform the scientific public about decisions made by the Academy's leadership organs. The journal is obligated to draw inferences from the lively experiment in restructuring. This also applies to the activities of departments, the functions of which are being strongly expanded and to academic institutes. It is necessary, for example, to illuminate the activities of commissions for the struggle against bureaucraticism, the experience in the transistion to a new system of paying for the labor of scientific workers, and the creation of temporary scientific collectives (especially of young people), etc.

Great changes are being made in republic and sectoral academies by the reorganization of the council for coordinating their activities. These changes should be quickly reflected in the journal.

The journal's pages should be open for free expression of Academy members' opinions on questions in the organization and life of science which interest them. There should be more reviews of Nauka Publishing House books on general scientific topics.

As has already been mentioned, our journal consistantly published articles which make specific suggestions about the organization of science. However, they were not very effective, as attempts by the editorial board to get any reaction from some ministries and departments, as well as "services" of the Academy itself usually went unanswered. We hope that now this will not be the attitude. Last year the Academy introduced the practice of reporting to the General Meeting on measures taken in response to critical comments from Academy members. The journal's editors should also periodically inform readers of what has been done (or not done) since the last issue.

The question naturally arises: in what articles can new material be published without increasing the size of the journal? In our opinion, by rejecting highly specialized articles. Such articles, as a rule written by noted scientists, can find a place in popular science or specialized survey journals. Scientific communications from the Presidium should be published in abbreviated form.

The journal will reduce its information on specialized international conferences. The section "International Scientific Ties" will mainly illuminate large congresses and forums conducted in the USSR; international projects and programs in which the Academy of Science is actively participating; the experiences of scientific collaboration on a bilateral and multilateral basis, especially within CEMA.

We will continue to decribe the active struggle of scientists to defend the world against the threat of nuclear war.

Delays in publishing information in the sections "At the Presidium of the Academy of Sciences" and "Chronicle and Information" are a substantial shortcoming of the journal. Much depends upon editorial board associates but it also depends upon others. For example, considerable time passes between scientific reports at the Presidium and when we receive the texts of these reports. There are also examples of very rapid (two-three) months publication of expecially important and timely material.

In discussions of the work of the editorial board and editors of this journal which have taken place at the AN Presidum and at meetings with the scientific public, the journal's role as a chronicler of the Academy's affairs has been noted. The Academician N. M. Emanuel noted: "This type of chronicle would be beyond the capabilities of a historian of the Academy, attempting to use archival material to write what is put together monthly by *Vestnik*, simply because it is not possible to dig up the tons of paper stored in the Academy archives."

Of course, we will honestly and emphatically write about those deep changes which are beginning to take place in the Academy's life. Today, however, the journal's main task is to actively participate in perestroyka.

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Filling of Orders on Competitive Basis

18140186 Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 24 Dec 87 p 1

[Article by Doctor of Technical Sciences Professor O. Mazurin (Leningrad): "Competition Will Name the Performers. Learn Cost Accounting"; first paragraph is SOTSIALISTICHESKAYA INDUSTRIYA introduction]

[Text] Starting next year in our science much should change: it is beginning to change over to cost accounting. But despite the fact that my colleagues from academic institutes in principle agree with the necessity of cardinal reforms in science, the mood of the majority today is more anxious than joyful. Moreover, first of all this concerns talented and efficient people. Those who, it would seem, should only gain from restructuring. Why?

The main cause of the anxiety consists in the fear that important operations, which are intended for the future and are aimed at the study of fundamentally new laws and at the development of fundamentally new technologies, might be drastically reduced or completely eliminated. In industry, which has been changed over to cost accounting, there will hardly be many enterprises and associations, which would be willing to finance operations which do not ensure the obtaining of a significant economic impact in the next 3-5 years.

It is often possible to hear that at academic institutes it is impossible to allow any elements of cost accounting. I categorically disagree with this. Until the collective of the academic institute depends materially on the results of its work, one should not count on the great efficiency of the recently introduced new systems of certification and the regulation of the wage in science. Given the fixed wage fund of the institute the material stimulation of a group of associates, which works well, signifies the automated decrease of the wage and all kinds of supplements to it for other workers. The collective is not interested in the stimulation of colleagues who work well. The aspiration for the unwarranted level of wages also originates here. Cost accounting should put everything in its proper place.

At academic institutes state orders—probably 70 to 90 percent of the total budget of scientific research institutes—should, undoubtedly, constitute the basis of cost accounting. But it is most reasonable of all to place them on a competitive basis. Moreover, all scientific institutions should have the right to participate in the competitions that are announced by the Academy of Sciences. In turn, let academic institutes participate in the competitions that are announced for the filling of state orders by ministries and departments. Moreover, the possibility of the drawing up of state orders on the basis of enterprising proposals of institutes themselves, after, of course, the careful evaluation of such proposals, should be envisaged.

Economic contracts with industrial enterprises should be another source of assets of the academic institute. But here radical changes in the now prevailing and essentially absurd system are needed. In conformity with it the amount, which is allocated to the academic institute in accordance with the contract for wages, is automatically withheld from the wage fund which is received by the institute from the state budget. As a result there is no material interest of the performers in the conclusion of contracts.

Moreover, even before the fulfillment of a contract the institute should plan in advance all the expenditures on equipment, materials, business trips, and so on. Here the breakdown of expenses by items is regulated by the client. Finally, the text of the contract usually contains a paragraph concerning the fact that all the equipment, which is acquired by the performer, is the property of the client. It is often possible to get round this paragraph. But in recent times developers have been hearing more and more often from the client: "We have cost accounting, we have begun to observe the rules, return our equipment." Who invented and for what purpose this bureaucratic nonsense in case of the conclusion of economic contracts?

In conformity with the recently introduced statute the performer can obtain from the client a specific proportion of the economic impact and can use this amount for replenishing his own material incentive fund. It would seem that a material interest is appearing for developers. But the specific nature of the work of academic institutes makes this possibility more an exception than the rule. In case of work on new materials and technologies the prompt obtaining of a real economic impact is impossible. Experimental design developments, the establishment of new works, and their assimilation should follow research.

Thus, the new procedure of stimulating operations, which concluded immediately with introduction, is prompting institutes to the completion of minor developments, which are aimed at the nonfundamental improvement of operating works. This runs counter to the basis tasks of academic science.

At institutes there is another reserve of the use of cost accounting for increasing the efficiency of work. Many scientific research institutes have single-design equipment. Highly skilled personnel work at them, there is experience in the production of new materials and items. Why should they not render services to other organizations in the production of small batches of new materials and give consultations? Many academic institutes are buried with requests for assistance.

A version of the prompt settlement of such questions was developed at our Institute of Silicate Chemistry of the USSR Academy of Sciences. It consists in the establishment of a small—with one or two administrative workers—pilot production division. Such a division could accept for quick filling one-time orders of the most different value. For the production of small batches of materials and items, for the making of measurements, calculations, a search of the literature, the holding of consultations. The prices for the jobs should be contractual and should be oriented first of all toward the use value of the scientific product.

Such work should be performed on the areas and equipment of the corresponding laboratories by staff members of these laboratories, first of all by young people, during the time off from the basic job within the intra-institute combining of jobs. This will simultaneously also solve an important social problem: the young scientist, in order to support his family, will not have to work on his time off as a janitor, cleaner, or telegram deliverer.

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Changes in Temporary Charter of Academy Research Institute

18140179 Moscow NTR: PROBLEMY I RESHENIYA in RussianNo 22,17 Nov-7 Dec 87pp 4-5

[Article by A. Olgin under the rubric "At the General Assembly of the USSR Academy of Sciences": "Three Hours of Discussion"; first paragraph is NTR: PROBLEMY I RESHENIYA introduction]

[Text] Disputes, replies, questions from the seats—such is how the atmosphere of the General Assembly of the USSR Academy of Sciences, which was held on 28 October of this year and was devoted, it would seem, to an exclusively procedural question—the making of amendments in the prevailing Temporary Charter of the Academic Scientific Research Institute—stuck in my mind.

But they originated as follows. Back on 2 July of this year the Presidium of the USSR Academy of Sciences established a commission for the preparation of suggestions on the replacement of the management staff of academic institutes. Vice President of the USSR Academy of Sciences Academician P.N. Fedoseyev became its chairman. In 2 months the commission sent its suggestions of academic scientific research institutes. After receiving responses (more than 100), the commission generalized them and submitted them for the consideration of members of the academy.

The changes concern five paragraphs of the present charter of the academic scientific research institute.

One of them (Paragraph 38) is about the election of the director of the institute. He is elected for a term of 5 years by the corresponding department of the academy and is approved by the Presidium of the USSR Academy of Sciences. But whereas now the departments consider only one candidate for the post of director of a scientific research institute, the suggestions of the Presidium of the USSR Academy of Sciences envisage the necessity and desirability of the nomination of several candidates. Moreover, each of them (the right to nominate candidates for director is granted to the bureau of the corresponding department, the members of the USSR Academy of Sciences, public organizations, and the scientific council of the institute) should speak in advance to the collective and present the program of his work. After this the collective of the scientific research institute by secret ballot specifies its attitude toward each of the aspirants to the post of director and submits the results of the voting to the department.

However, the number of votes, which have been received by each candidate, at the institute does not determine the opinion of the department—it elects whomever it considers necessary.

An essentially analogous procedure was also elaborated for the managers of institute laboratories (Paragraph 53 of the charter of the scientific research institute).

If, let us assume, a corresponding member or a full member of the academy aspires to the position of head of a laboratory, such an appointment does without any "competition"—an order of the director is sufficient. Let us add that the practice of the noncompetitive appointment of members of the academy has existed now for more than a decade and has "migrated" from one charter to another.

Changes in the paragraph of the charter of the scientific research institute (Paragraph 45), which regulates the activity of the scientific council of the institute, were also proposed. According to the present regulations the personnel of the council and its sections are approved—upon the representation of the director—by the corresponding department. The General Assembly of the USSR Academy of Sciences was ordered to approve a completely new procedure: to elect the members of the scientific council at assemblies (conferences) of the scientific associates of the institute.

The procedure of replacing other important institute management positions—deputy directors for science (Paragraph 50 of the charter of the scientific research institute) and for general questions (Paragraph 55 of the charter of the scientific research institute)—also did not remain unchanged.

Here, in essence, are the amendments to the charter of the academic scientific research institute, which Academician V.A. Kotelnikov reported to the General Assembly. Their discussion, it must be acknowledged, did not reduce just to approval. I will cite several excerpts from the statements of members of the academy.

Academician A.A. Spirin: "Science has its own specific nature, and the question of managers in it is, rather, a matter of experts. But it is also necessary to take into account the opinions of the collective—one should not work with an entirely unacceptable director or head of a laboratory. Therefore, I am submitting a single amendment—to elect the director or head of a laboratory accordingly in the department or scientific council of the institute, and then to submit these candidates to a vote of "confidence—no confidence" of the labor collective. Such a procedure changes radically the psychological situation of the election."

Academician I.P. Alimarin:

"Let us take the paragraph, in which it is stated that a director 'elected by the department' is at the head of the scientific research institute. How is he elected—by secret or open ballot? Specification is needed. The same thing is also stated about the members of the scientific council, who 'are elected by the assembly (conference) of the collective of scientific associates of the institute.' Once again it is unclear how—by secret or open ballot? And when are they considered elected? In case of the obtaining of more than 50 percent of the votes? It is necessary to eliminate these uncertainties.

"Also take the suggestion that the deputy director for scientific work is approved by the bureau of the department in accordance with the representation of the director, 'which is endorsed by the scientific council of the institute.' But what is 'endorsement'—election or not? I, say, endorse, but my neighbor—also an academician—does not. What then is to be done?"

Academician V.V. Menner:

"I will speak about a most sore and urgent topic—the appointment of members of the academy to the positions of heads of scientific research subdivisions without competition and election. Unfortunately, a large number of major troubles and misunderstandings at several institutes force me to suggest eliminating this paragraph from the charter of the scientific research institute and establishing elections for members of the academy."

Corresponding Member of the USSR Academy of Sciences N.A. Zheltukhin:

"I would think that a newly elected director should not strive to manage a laboratory. During the first years of his work he could form for his own developments only a temporary collective. It is inadvisable for him to hold other administrative positions."

Academician Ya.M. Kolotyrkin:

"I am afraid that as a result we will elect managers of structural subdivisions only from within our own institute. But the exchange of scientific personnel among various scientific research institutes is a most important condition of the development of science.

"Therefore, I propose to note that the scientific council makes the decision on the election of heads of laboratories with allowance made for the opinion of the collective, but without necessarily directing attention only to it."

The discussion of the draft, which was submitted by the Presidium of the USSR Academy of Sciences, was repeatedly interrupted by remarks from the audience. Here is a short dialog of President of the USSR Academy of Sciences G.I. Marchuk with an academy colleague:

"Might a situation form, when people, who are not managers of structural subdivisions of a institute, get on the scientific council?"

"Of course!"

"This will complicate the work."

"But what is to be done—restructuring always involves difficulties."

Here is another one, with Academician D.F. Knorre, who had already spoken.

"The very idea of the appointment of the scientific council by election is clear, and there is no reason not to support it. But junior scientific associates, who have not earned a degree, might also get on the council. Such a council will not be authoritative for anyone. Therefore, I suggest to note that the scientific council is elected primarily from among people with academic degrees."

"But what will it give us, if we write the word 'primarily'? For all the same they will elected whomever they want...."

In short, this General Assembly was least of all like a well-directed meeting, the result of which is clear in advance to those who conduct it.

By the time of the General Assembly the election of directors had already been held at six academic scientific research institutes. It took place not easily and, so to speak, "according to different systems." President of the USSR Academy of Sciences G.I. Marchuk, who set forth the concept of the restructuring of the work of academic scientific research institutes, told how it will take place in the future.

"Initially," he said, "the director of the institute is elected. The remarks, which have been made by members of the academy, will be taken into account in the statute on his election. Then the director announces the

election of the scientific council—all scientific associates of the institute will participate in this procedure. A democratically elected organ, on which the director also relies in his work, thus emerges. Further, he orders the scientific council to examine the new structure of the scientific research institute or to confirm the old one. Then the election of all the other officials of the institute and the managers of its structural subdivisions is announced."

What has been said does not at all mean that everything that previously existed will be swept away. The academy is strong in its schools, which have made a substantial contribution to the development of basic science. As before, they will be strengthened. But at the same time completely new research directions will also begin to be developed—in the form of temporary special-purpose research collectives. If significant results are obtained here, such temporary collectives can become a part of the permanent structure of the scientific research institute, or else be formed into a new institute.

It is assumed that such an arrangement of the life of every academic scientific research institute will begin to operate after the term of office of its present managers is over, or the position of director of a scientific research institute for some reasons becomes vacant. In practice this means that approximately 2-3 years will be required for the changeover of all academic institutes to "the new life."

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Role of Literature in Scientific, Technical Progress

18140180 NTR: PROBLEMY I RESHENIYA in Russian No 22, 17 Nov-7 Dec 87 pp 1, 5

[Interview with Daniil Aleksandrovich Granin by NTR: PROBLEMY I RESHENIYA corresponding V. Kovichev: "The Position and Postures. An Interview with Daniil Granin"; date, place, and occasion not given; first paragraph is NTR: PROBLEMY I RESHENIYA introduction]

[Text] Today in science people, whose vocational choice at one time was determined in many respects by literature about scientists, which was written in the 1960's, and particularly the indisputable best sellers of that time—the works of Daniil Granin—are stepping into key positions. How does the writer himself rate what has been done in science by the generation of his readers? Our correspondent V. Kovichev asks him about this.

[Question] Daniil Aleksandrovich, at times it seems to me that public opinion with respect to science in recent times has changed—from the placing of trust in it, belief in its strength and wisdom, and the admiration of scientists to disenchantment, even the fear of scientific and technical progress, the expectation of all kinds of troubles from it....

[Answer] Yes, disillusionment exists, and not unfounded disillusionment. In the eyes of society science has discredited itself by several problems, which it did not want to and was unable to solve. First, there are ecological problems. The pollution of Lake Baykal, Lake Ladoga, rivers, and the air, large works which are not provided with ecological protection—there are too many examples for it to be possible to ignore them and not to draw conclusions. Second, there are nuclear electric power plants. The lesson of Chernobyl should be applied not only to equipment and organization, but also to science, which oriented our power engineering, in my opinion, in a nearsighted manner: in many countries the emphasis is being placed on renewable sources of energy, we are continuing to place trust in the atom. Third, actions of a moral order, the pursuit of titles, the domination of mediocrity, the "director's office" of the Academy of Sciences, and so forth affected, of course, the authority of science. Everything is explicable. It has become evident that a career and material factors play too large a role in the life of many scientists. The former character of a scientist—a person, who is removed from fusses and daily life and is capable in the name of knowledge and irrepressible research curiosity of surmounting all obstacles and ignoring all temptations and his own gain—this image has become obsolete. But it is pointless for "realists" to be excessively principled. The compromises, to which they agreed with the authorities, also led to disenchantment. And to the sad consequences of the unscrupulousness of scientists.

[Question] Is that not why writers take upon themselves the tasks which scientists should accomplish?

[Answer] It is not entirely that way. Writers undertake to defend common sense, because someone should do this. But it is impossible to say that only they alone should. There are different scientists (incidentally, as there are writers). I remember that long before the public discussion of the problem of diverting northern rivers, NOVYY MIR held in Novosibirsk a round table of writers with scientists of the Siberian Department of the USSR Academy of Sciences. A group of very good specialists headed by Academician A.G. Aganbegyan, other academicians, and corresponding members was there. Relying on conducted research, they spoke about the dangerous consequences of diversion. Unfortunately, at that time these materials were not allowed to be published in NOVYY MIR. But when the journal EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTA published them, A.G. Aganbegyan as editor in chief really got it for such liberty. But life showed who was right.

[Question] But your activity in defense of Leningrad again the levee did not end so successfully....

[Answer] It has not at all ended yet. The explanations of scientists, who reject the apprehensions with regard to the ecological consequences of the putting of protective structures into operation, do not seem convincing to me.

Construction workers and scientists, who have given their approval to the construction project, are trying with all their strength to defend what is being done, while not wishing to investigate and rejecting from the threshold the opinions of specialists, who are of a different point of view. I cannot be the judge here. I am not a specialist who to a sufficient degree has a command of all the problems which are arising on account of the levee—biochemical, hydrological, ichthyological, transportation, and so on.

The free, calm examination of the opinions of the sides and the formation of an unbiased arbitration opinion are needed. Attempts at such a discussion were made, but did not lead to anything due to the rigid stand of the construction workers: enormous assets, they say, have already been invested. But it is still necessary to see what is more expensive—to tolerate the present losses or to eliminate the future consequences of construction. For thus far there is very much confusion. The problems of water treatment facilities have not been solved. And it is a matter not only of time. Such are the fruits of the strong-willed method of management. There was no a broad free discussion, science held aloof from the comprehensive study of the problems, and departmental interests prevailed.

[Question] Daniil Aleksandrovich, your books of the early 1960's are permeated with the romanticism of research work. Many of my friends, having read "Iskateli" [Seekers] and "Idu na grozu" [I Head to Danger], began to rave about physics, went to technical higher educational institutions and into science, they imitated even in manners your heroes. Well, if you were now to write "Idu na grozu," would you depict scientists in the same way?

[Answer] Of course not. Both because I myself have changed and because life has changed. It is a matter here not of some disillusionments, it is simply impossible to enter the same stream twice. But as to the attitude as such toward science.... No matter how we treat it, the problems which life poses—technical, food, social—once again science alone cannot solve them. But it should work on them with allowance made for the bitter lessons of the 1960's and 1970's. History should teach something, otherwise new mistakes are inevitable.

[Question] Then about what history teaches. The history of science and the fate of outstanding individuals are reflected in "Zubr" [The Die-Hard]. I understand that not everyone accepted your point of view of the hero, but who actively came out against it and why?

[Answer] Here is the most characteristic letter—from a biologist, doctor of sciences, and professor from Kemerovo—Logachev. During the lifetime of Timofeyev-Resovskiy he also came forth with slanderous accusations, asserting that since Nikolay Vladimirovich was in Germany under the Nazis, hence, he worked for them. At one time a group of our biologists headed by Corresponding Member of the USSR Academy of Sciences Yablokov gave an explanation with regard to the denunciations of Logachev, which he had sent out everywhere. Now, following the publication of "Zubr," Logachev, Ioganson, and other present-day "Lysenkoites" again have begun to write to all instances that Timofeyev-Resovskiy is an accomplice of Goebbels (literally!) and conducted research for the support of racist theory. Well, there is nothing new—it is the tried principle of Vyshinskiy, when a person should prove his innocence. I—at one time—while in the GDR specially inquired into the possibility that the Die-Hard in Buch would have dealt with such problems. There are studies of historians of genetics, they established which of the geneticists worked for the fascists. And they ascertained precisely: the laboratory of Timofeyev-Resovskiy never dealt with human genetics, it dealt only with fruit flies. The slanderers do not have and did not have any proof, but they consider it possible to repeat their conjectures. This is typical of "Lysenkoites"—of their manner, their method of sticking on labels and political accusations. You see how much time has passed since the discharge of the "people's academician," but his case is alive. The exposure of Lysenko did not lead to the disarming of the Lysenkoites. All of them have titles, all remain in chairs and are doing everything possible to hinder the development of genetics. And, apparently, they can do much. Not by chance is genetics in our country, as Corresponding Member of the USSR Academy of Sciences Georgiyev wrote in PRAVDA, in a difficult situation. These are the consequences of the activity of the Lysenkoites, they have not ceased the struggle. I think that in our present revolutionary times we should not only return the honorable name to people who have been undeservedly forgotten and slandered, particularly prominent scientists, but also finally get rid of the harmful legacy of past times—be it unfounded accusations, political slanders of the supporters of an opposing direction in science, the making of important decisions without their free discussion, or the refusal to stand up for one's own position for the sake of considerations of one's career and the interests of a department.

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Potentials, Problems, Conditions of Entrepreneurship

18140176 Moscow NTR: PROBLEMY I RESHENIYA in Russian No 22, 17 Nov-7 Dec 87 pp 1, 6, 7

[Article by Candidate of Economic Sciences D. Kuzin, senior scientific associate of the Institute of World Economics and International Relations of the USSR Academy of Sciences: "Entrepreneurship of the 1980's: Notes of an Economist"]

[Text] For decades we regarded entrepreneurship as a private capitalist activity, which involves pressure, enrichment, personal prestige, and, finally, exploitation.

No doubt, this is so, and all the same it would be incorrect, having made evaluations, not to look closely at this phenomenon in all its diversity, especially today.

The 1980's are a period of an entrepreneurial boom in the West, while the term "entrepreneurship" abounds on the pages of business journals and books on economics and management and does not leave the lips of professors of business schools and other specialists. What is this—a propaganda campaign or the next management innovation, of which there have already been quite a few in recent decades? Indeed, the ideological aspect is obvious here, but then as to the essence, it is worth looking into this.

What is modern entrepreneurship? In the narrow sense this phenomenon is linked with the rapid development of small business, which, in the estimations of many bourgeois economists, not only plays an important role in the stimulation of scientific and technical progress, but also serves as one of the key factors of economic growth as a whole. According to the data of the American research firm the Futures Group, about 55 percent of the 8,000 innovations, which have been made in U.S. industry in recent years, are "on the conscience" of small firms. Their role in the change of the structure of the economy, the service of big business, the provision of employment, especially among regions, the prompt and high-quality meeting of needs, as well as in other areas is now very great.

But this is just one side of the coin. The other involves the broader interpretation of entrepreneurship. Its restoration turned out in the capitalist world to be quite successful by no means due to the attractiveness of individual initiative and success. The point is that during critical periods (and the capitalist economy during the 1980's is going through precisely a crisis, which is due to the need for the structural reform of the economy in conformity with the requirements of scientific and technical progress) an entrepreneurial style of economic behavior and its spread in society are becoming economically necessary.

New trends are appearing in the decentralization of management, the increase of its standards, the lending of greater flexibility to large organizations, the increase of the speed of their reaction to changing external conditions, and the granting of economic freedom to individual subdivisions. Previously this was underestimated and for this reason often led to negative results. The enormous programs of capital investments and the extensive automation and computerization of production without the adequate solution of the problems of the organization of labor, creativity, and its simulation, as the practical experience of even such large corporations as General Motors showed, fell short of the expectations.

Therefore, in the past 5-7 years many large, especially science-intensive companies have begun to experiment actively in the search for more efficient management. A quite specific solution was found in the introduction of the principles of small entrepreneurship. In practice this took the form of the establishment within such firms of numerous small and semi-autonomous formations, groups, brigades, and so forth, which carry out the search for and development of promising ideas and products in new directions.

A great freedom of actions, the availability of rights and resources, which initially are allocated from general corporate funds, and then are accumulated, a creative climate, individual systems of stimulation—that is what distinguishes such entrepreneurial groups. In essence a completely different "innovation" culture forms in them. And that is why creative people, who strive for the solution of new problems and for self-expression, come here.

In such a structure of complex economic organizations there is much that is efficient. Large firms are, as a rule, intersectorial, multinational associations, for which it is very difficult to stay at the crest of competition without a flexible "minibusiness" within, without the constant search for its own researchers and developers, and, finally, without the creation of a kind of buffer in the form of innovation groups or enterprises.

Of course, the development of intrafirm entrepreneurship could not have taken place without the understanding and support of the top management of these companies, without the creation in them of a climate, which makes innovation nature, without the formation of favorable conditions for the free discussion of ideas, without the dissemination of information, without the formation of interdisciplinary research teams, and, finally, without the allocation of assets for ideas.

This contributes to the constant process of innovations and a chain at times of small, but constant improvements in technology, products, and services, which in the end yield large gains. Many western specialists believe that today the management of innovation is not the management of people, but rather the influencing of the environment, in which they realize themselves as individuals and develop their abilities, in the interests of the company, of course.

Another important element is entrepreneurship and competition. From an orthodox standpoint everything seems clear here. Yet not stereotypes of thinking, but the problem of the admissibility of elements of healthy competition in our economy and the question of what entrepreneurship can provide on this level, interest us.

It seems that, first, there is the shattering or undermining of various monopolies in our economy: the monopolies of views, mechanisms, producers, suppliers, and so on. In the broad sense it is a question not only of an economic, but also a psychological and cultural phenomenon, which is sweeping away stereotypes of thinking

and, consequently, management. Have we achieved the optimum results from our monopolies? The necessary results, perhaps, yes we have, but the optimum results—hardly.

Entrepreneurship (or socialist enterprise—by it we will understand the style of economic activity, which combines the ability to work out the necessary solutions and to ensure their fulfillment under the conditions of an inadequately organized environment in the name of the achievement of regional and national economic end results) affords new opportunities, it, figuratively speaking, makes it incumbent to stir, seek, and act. But healthy competition can only spur initiative and actions. As a means of achieving our program goals it is not only useful, but also necessary. Moreover, it logically follows from the reform of the economic mechanism.

Shoots of entrepreneurial behavior also exist in industry. For illustration of this it is sufficient to turn to the experience of the Ivanovo Machine Tool Building Production Association. Much has already been written about it, but I want to direct attention to the following.

Back in 1971 at the enterprise the basic principles of its activity were formulated, which in the language of the modern science of management is called "vision," that is, the integral understanding of the goals and tasks of the organization and the means of their achievement and the organizational unity around these values of the entire collective. For precisely vision is what distinguishes innovative firms abroad.

For the Ivanovo people it signified the combating of routine and stagnation, an orientation toward the consumer, the creation of the conditions for creativity, and work with young personnel by the encouragement of initiative with greater trust. But the principles, however good and advanced they are, without actions that back them, without a drive for what is new, and without attempts to change the stereotype of management and administration would have been an empty phrase. The Ivanovo people won fame precisely by their actions. And by the results as well.

But now let us turn to the question of risk. Entrepreneurship and risk are directly interconnected, and this is quite natural. The search for and introduction of a new thing bear the uncertainty of how this will be perceived and understood, whether this will satisfy the demand, and, finally, whether it will provide revenue. Such are the nature of innovation and its economic evaluation. But how is this problem understood at times in our country?

Conversations with the managers and chief engineers of a number of enterprises showed a quite specific attitude toward risk. The majority view risk in administrative, and not economic categories. And probably nonstandard behavior, trial and error, and innovations represent a threat first of all to their position as managers. "Initiative is punishable"—this everyday principle, unfortunately, has become deeply ingrained in the consciousness. To what does this testify?

First, to the fact that a significant portion of the managers think in categories of the administrative system of management. And this is not only their fault. The attempts to minimize administrative risk are a consequence of the economic environment, in which they have acted up to now. The concept of the economic can come into use in their notions only with the reform of management, with the creation of the conditions, which will force them to change their economic behavior and will force them to constantly seek and make an economically sound choice, to direct their attention to the consumer, and to interact closely with clients and partners. Only when managers and their collective become the real masters of enterprises, will the development of the latter and accordingly the well-being of all the workers depend on the results of their labor and will the risk of what is new become natural and economic in nature, and not administrative for the most part.

Second, this is the problem of the psychological attitude toward searching and the failures of the management of the enterprises and of innovators themselves. Here it is worth turning to foreign experience. The practical experience of many leading capitalist companies showed that an enterprising inquisitive style of economic behavior can be strangled, if an atmosphere of tolerance toward failures is absent in the organization. Therefore, the management of firms first of all attempts to instill in its staff members the understanding that a high risk of failure is natural for the process of innovations. Initiative becomes not only not punishable, but, to a certain extent, also rewarded.

Such tolerance is achieved by various methods. At the large American 3M Corporation, which has won fame throughout the world for its scotch tape and many other products, guarantees the members of research teams and groups (the personnel of which, incidentally, are raised on a voluntary basis—"for an idea") their former status and salary even in case of the failure of a project. Several Japanese firms, for example, Matsusitu, are going even farther. They reward their innovators, who have met with failure, with bonuses, just like the winners of competitions (of course, in smaller amounts), or give them honorary gifts and medals, which symbolize the gratitude of the management for the displayed initiative.

Nothing so checks innovation as constant, especially insufficiently competent interference and the necessity of consultations and the waiting for permission. Surveys of large firms showed that the transfer of day-to-day control to the level of groups significantly improves the indicators of work, stimulates cooperative relations, and increases the quality of the satisfaction of consumers. In an atmosphere of trust control acquires a different

content. Not preventive control, according to the principle "something might happen," but flexible, decentralized, more democratic control. Strategic choice, the creation of an economic environment, the control of the development of new directions, and the regulation of their conformity to the available potential and economic situation become the affair of the top management of the firm.

As we see, much in the principles of modern entrepreneurship is changing the former notions and methods of management. Of course, it would be incorrect to agree that this is nearly "a revolution in management," as they are declaring in the West. But this phenomenon, no doubt, is perceptible and multidimensional. A number of foreign firms already have in this area both experience and successes. Others are groping for means of reforming management. However, practically all are studying the principles of entrepreneurship, which reflect the current of scientific and technical progress.

On what conditions can and should they undergo development in our country? In my opinion, there are at least three of them....

The first. The availability and accessibility of venture (risk) capital, the market of which has formed in the past 15-20 years and which in just 10 years, according to some estimates, increased by two-hundredfold, are the main factor of success of modern entrepreneurship, first of all in the United States, where economic traditions undoubtedly are also contributing to it. In our economic system for the present even an approximate analog of this phenomenon does not exist. The reform of the economic mechanism can afford here new opportunities, which exist along with the assets which lie as if on the surface—the personal savings of citizens, the revenues of enterprises, local funds, and so on. The whole question is how to use them. Bank credit and the assets, which have been accumulated by enterprises through self-financing, and currency receipts can play a new role.

The second condition is the necessity of the extensive development of the sphere of consultation, including management consultation. The need for it will increase in connection not only with the development of individual or cooperative labor activity, but also with the qualitative nature of the entire restructuring of the management of the national economy, with the appearance of a larger number of our enterprises on the world market, and, finally, with the change of the conditions of the activity of enterprises and organizations in our country. Are such consultants today and does their number conform to the scale of our economy? There are, but there are very few of them, and, what is the main thing, their organizational and legal status is not entirely clear.

The third condition. High class consultants, just as entrepreneurs, cannot appear without the corresponding system of their training. In business schools in special courses for the improvement of skills (for example, attached to the American Management Association, which has contacts with tens of countries of the world) very much attention has been devoted to this question, particularly in recent years. Are they training such specialists in our country? No, but they must, and as quickly as possible.

Present conditions make it incumbent to think more, to compare, to make a more sound choice, to combine, and to find means for incorporating the new relations in the economic system. And, therefore, it is important to understand that an advanced, innovative, and competitive economy is not only a sector of "high technology" and a small island of advanced know-how, it is an integral system, in which the search for opportunities, innovations, an orientation toward changes, and constantly increasing needs of people become not an episode, but the norm in all spheres of life. The main lesson, which we can and should learn from the experience of entrepreneurship of the 1980's, is visible in this.

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Marchuk on Restructuring at Academy of Sciences

18140155 Moscow ZNANIYE-SILA in Russian No 11, Nov 87 pp 25-28

[Interview with President of the USSR Academy of Sciences Academician Guriy Ivanovich Marchuk by B. Ponkratov under the rubric "Science: Tasks, Goals, Values": " 'Restructuring Is a Very Science-Intensive Process.' An Interview With President of the USSR Academy of Sciences Academician G.I. Marchuk"; date, place, and occasion not given; first paragraph is ZNANIYE-SILA introduction]

[Text] The 27th CPSU Congress interpreted thoroughly and in a Leninist way the times being lived through and combined in its decisions the greatness of the goals and the realism of the possibilities. The uncompromising, candid evaluation of everything that is hindering progress is a fundamental, Leninist position and an indication of the strength of the party. Under present conditions, as was emphasized at the January and June CPSU Central Committee Plenums, our society is again being checked for dynamism and for the ability to climb quickly the steps of progress. In every sphere of activity of the Soviet people, in every field of knowledge, and in every area of art the interpretation of the tasks posed by the party as applied to one's own work is under way and their fulfillment has begun. The articles of the section reflect precisely this. Here it is a question of how and where science is being done today and how to better organize "the generation of knowledge," the place in it of young scientists is examined, the means of studying our society itself and several conclusions from the already conducted research are revealed, and questions of ecology and the importance of information science for the solution of the global problems of the present are examined.

[Question] Guriy Ivanovich, in recent times all the activity of the Academy of Sciences has proceeded under the sign of great changes. The implementation of an entire program of transformations in the work of the headquarters of Soviet science has begun. What are the main directions of restructuring at the USSR Academy of Sciences, by what are they determined, what is their specific nature?

[Answer] First of all I will stress: the point of what is now happening at the academy lies not in its reorganization as such. The very content of our activity, and first of all the activity on the development of basic science, which is the main task of the USSR Academy of Sciences and for which it is responsible, should be restructured and should acquire a new quality.

We should attain leading gains and achieve the highest world level in the key, priority directions of basic research. This is a problem of state importance. And what is being done is not an intra-academic measure, but a component, and in many respects also the basis, of the truly revolutionary changes, which are intended for the distant future and which are occurring now in the country: the radical intensification of the economy on the basis of the new economic mechanism, the sharp increase of the pace of socioeconomic development, the comprehensive democratization of society, the activation of the human factor—it is by this that the main tasks of our transformations and their nature are determined.

Once again I stress—the development of basic research. It is needed both as the base of the development of science itself and as a source of fundamentally new ideas for the development of machines, technologies, and materials. These ideas, laboratory models, and "test tube" technologies, which have been proposed by academic science, should in the end be materialized by means of sectorial science. Such is the formula, which was, is, and will be basic for the determination of the place of academic science and its influence on the national economy.

Now not improved, even not simply new, but fundamentally new technologies and materials are needed. But they originate only on the basis of profound basic developments. Strictly speaking, this was already stated long ago: there is nothing more practical than a good theory. Now the former paradoxical nature has disappeared from this aphorism of Boltzmann: another means of revolutionizing social production, except through basic science, simply does not exist. Precisely by developing basic science, in the end we obtained an enormous practical impact—an immeasurably greater one than in case of the aim at a narrow practical task. Such are the interrelations, in case of which both science and production stimulate the intensive development of each other.

All this is quite obvious, but often it was not possible to achieve the practical realization of such relations. As a result both production and science suffered, in both spheres development remained mainly extensive.

[Question] How in this case should the proper relations with industry be ensured?

[Answer] We waited for a long time for when science would be accepted fundamentally and actively by the entire national economy. For a long time it was clear that the means of extensive development has a limit; and in fact this limit had already appeared several years ago. A directive plan accompanied extensive development. At one time directive planning made it possible to commit to the sphere of social production all the resources that we had. This was a significant advantage in the development of our economy, when it was necessary in the shortest time to achieve the set volumes of production of the basic types of industrial products. The intensive means of development already requires smaller volumes of production, but its greater intellectualization and science-intensiveness, as well as the combination of the plan with initiative. And that is why the attitude toward scientific developments and technology is changing fundamentally.

The situation with the introduction of the results of scientific research, as it was in our country until recently, is well known. Industry, first, was not interested in the implementation of new technologies and technical solutions and in the changeover to the output of new products and, second, often was not able to accept technical and technological innovations. Hundreds of completely finished developments are not introduced for years and decades, because enterprises find much easier and more profitable—for them, and not for the national economy!—means to achieve the indicators that are required of them. More precisely, the director of a plant will willingly introduce something, but, as a rule, only what simplifies and decreases the cost of already organized production, and does not revolutionize it.

[Question] What means have been outlined for the achievement of all these goals and what are the main directions of the restructuring of the work of the academy?

[Answer] There are four main directions. First, the improvement of the forecasting and long-range planning of scientific research, as well as the practical implementation of its results. Second, the restructuring of the management of science. Third, the radical improvement of the coordination of scientific research in the system of academic, VUZ, and sectorial science on the basis of the most important all-union programs. Finally, fourth, this is the improvement of personnel policy.

First of all I want to stress that the forecasting and identification of the long-term trends and prospects of development of basic science are not an entirely new task for the academy. Attempts at forecasting the development of science were also made in the past. But now it is becoming one of the most important components of restructuring and constitutes its essence, because the forecast is simultaneously also a program of action: what

is to be done in order to maintain the leading positions in those directions, in which they have been achieved, while in others to quickly attain the world level. The forecast specifies the guidelines and means, by which leading levels in basic research will be achieved, that is, it affects all aspects of the activity of the Academy of Sciences.

The formulation of programs of basic research for the next three or four five-year plans has been started. In essence, these programs will be all-union ones, with a clear orientation toward revolutionary innovations, that is, toward fundamentally new technologies and materials and new designs of machines. Thus, the basic instruction of the 27th CPSU Congress concerning the fact that the Academy of Sciences should become the coordinator of scientific work in the country and the integrator of all the basic directions of science will be fulfilled.

In order to ensure the effective forecasting and determination of the priority directions, it is necessary first of all to analyze thoroughly, comprehensively, and in a self-critical manner the state and results of scientific research in each field of knowledge and at each scientific institution. This analysis should be accompanied by suggestions on the development of the most important scientific directions.

The following fact is also indicative. The work on forecasting and long-range planning now encompasses not only the natural and technical, but also the social sciences. And this is understandable: under present conditions precisely the social sciences support theoretically the process of restructuring, which, strictly speaking, should itself become the practical embodiment of the broad prognostic scientific conception.

[Question] That is, is restructuring itself a very science-intensive process?

[Answer] Yes, and this will require first of all the development of the social sciences. Enormous work has to be done on the improvement of the entire system of socialist production relations and the methods of the realization of public ownership, on the development of socialist democracy, and on the stimulation of the human factor. Thus, the social sciences have to accomplish the most important practical tasks of our development and, moreover, with an aim toward rapid introduction. It is important that the beneficial effect of feedback should inevitably appear here: such a practical aim cannot but revolutionize the social sciences themselves.

The difficulty of this work is being increased by many problems in the development of our social sciences themselves. A large number of obsolete conceptions, which are hindering the revelation of the real laws and, what is more, the real contradictions of the development of our society, and factors, which contributed to the formation of the mechanism of deceleration, about which Mikhail Sergeyevich Gorbachev spoke, have accumulated in this field. Stable tendencies toward scholastic theorizing, empty talk, and the reluctance to study reality have been observed in many social sciences. Of course, the poor receptivity to new ideas, first of all in the field of economics, on the part of central organs of planning and management also appreciably affected the efficiency of research.

[Question] That is, are there here as well its own specific difficulties with "introduction"?

[Answer] Unfortunately, it is not only with this. Subjective factors also left a certain mark on the formed situation in this field.

Thus, in the social sciences three important comprehensive directions have been singled out as priority directions. The first is economics. This is quite natural. We need now an integral conception of the new economic mechanism, since, as is known, the party and government have outlined a number of major reforms in the area of finance, credit, pricing, and the forms of the organization of production. The most serious theoretical basis is necessary for them. The determination of the optimum proportions of the development of the means of the modernization of the national economy. All this requires fundamental economic research.

It must be said that now certain positive trends are visible in economic science. The serious and just criticism meant for it, including from the rostrum of the 27th party congress, was taken into account. Earnest reorientation toward urgent problems is now under way at practically all our economic institutions. This is a difficult, even painful process, but it is already under way.

The second direction is socioeconomic forecasting and the determination of the trends and prospects of socioeconomic development on the basis of scientific and technical progress. Some successes exist here; but as compared with what is required, they are completely inadequate.

The third priority direction is the entire set of disciplines which are connected with the humanities. Especially many specialists: sociologists, psychologists, economists, philosophers, lawyers, medical personnel, ecologists, historians, art critics, and many others, are united here. Sociology is acquiring particular importance for us.

We will not be able to do anything practical, if we do not launch in-depth, intensive, qualified demographic research and the study of the social structure of society, national and international relations, the motives of social behavior and labor activity, and the problems of young people, women, and representatives of the older generation. And, of course, this research should be methodologically strict and objective. Just as history should study what was in reality, so sociology is obliged

to study what is in reality. Otherwise it will merely reproduce the a priori scholastic assumptions, which so often hindered development.

Research in the field of law holds a large place in the set of humanities.

The attention to the entire set of problems of the human factor at the USSR Academy of Sciences is increasing. In particular, it is possible to mention the organization of the new scientific council of the USSR Academy of Sciences for the complex problems of man. However, as a whole very much still has to be done in this direction.

The management of the Academy of Sciences believes that now one should not spare assets for the development of the social sciences and in this field all the necessary conditions should be provided for productive scientific activity, especially as relatively small financial expenditures are required for this. In order to provide these conditions and to achieve the maximum return, it is necessary to increase the attention to the formation of the structures and staffs of humanities institutes. It is especially important to attract here talented young people and to guarantee them the possibility of fruitful work.

As to the other directions, here it would also be more correct to single out as the priority ones entire sets of disciplines, the development of which supports all the others. Strictly speaking, these directions are key, decisive ones for the assurance of the economic profitability of modern production and product quality: electronic computer technology (and, more broadly, what is now called "information science"), new materials, and, finally, instruments for scientific research.

Our close attention to these fields is explained not only by their decisive role in the acceleration of scientific and technical progress. It is necessary to frankly admit that these are precisely the areas, in which our lag behind the highest world level has formed most noticeably, although, of course, there are also successes. As is known, in 1985 the entire new Information Science Computer Technology and Automation Department emerged in the system of the USSR Academy of Sciences, while within it there are more than 10 scientific institutions. This is an important step in the development of academic science.

Along with this it is necessary to name without fail such a direction as biotechnology, which is ensuring not only the intensification of all agricultural production, but also the obtaining of unique medicinal preparations. The development of this direction for the present is also not satisfying our needs. I will note that now the capital investments in this sphere as one of the highly profitable spheres are increasing especially rapidly in the industrially developed countries. In our country one can see this well from the example of the well-known Institute of Organic Synthesis of the Latvian SSR Academy of Sciences. This academic institute, using its own pilot industrial base, set up the production of a large number of drugs, including on the basis of the methods of cell and genetic engineering. These preparations enjoy deserved success not only in our country, but also in other countries. Thus, we also need to invest much effort and capital in biotechnology.

Only the most important of the priority directions, which have to be brought up to the world level, have been listed. In reality there are far more of them; they require work in the new way from each department and each academic institute. The restructuring of the entire structure and system of management of the USSR Academy of Sciences should also become the organizational support of such work.

[Question] Is it possible to express briefly the essence of this organizational restructuring?

[Answer] This is, first, the elimination of the excessive centralization of the management of scientific activity and the extension of democratic principles and glasnost in the management of science, second, the creation of a more flexible structure of scientific institutions, and, third, the development of the regional organization of science.

Until now the departments carried out only the scientific methods supervision of their institutes. The rights of the departments, which have become the basic scientific and scientific organizational centers, have now been broadened. The powers on the approval of the basic directions of research, on the organization and support of operations, and on the settlement of personnel questions have been transferred to the departments. The main responsibility for the state and level of basic research in their specialization and for the attainment by our science of the world level has been assigned to them.

Science is being done at institutes There the methodology of research and investigation is formed, there specific achievements originate. Therefore, the next unit of organizational restructuring is scientific institutions. Here it is intended to establish a more flexible organizational structure of institutes and to increase their independence and scientific responsibility. This will make it possible to organize more rapidly the elaboration of new, more urgent scientific directions and problems, to react more rapidly to the changing processes in science, and to use scientific personnel more efficiently. Only then will we make restructuring a tool of the increase of the efficiency of basic scientific research.

Now a few words about the development of regional science. It is specifically a question first of all of the fact that several months ago the Far Eastern and Ural scientific centers of the USSR Academy of Sciences were transformed into departments—the same as the Siberian Department. Precisely its experience and its history and modern achievements helped to realize the fruitfulness of this means of the development of our, academic, science, so to speak, the means of regionalization. Its

essence is close contact with local state and party organs, once again for joint, mutual development: the scientific center helps to solve practical problems of the region, local management contributes in every possible way to its growth. Here self-development, which was spoken about at the beginning, appears especially clearly. Experience shows that such cooperation yields a much greater impact than the direct supervision of regional science from the center.

Both established regional departments are conceived as completely new formations. The Far East and the Urals are very unique, specific regions, with their own nontrivial problems. Here there is no opportunity to speak about them in essence, but it is important that the more of a specific nature the region has, the more favorable the prospects in it of the development of basic and regional science also are. Local higher educational institutions, scientific research institutes, scientific production associations, and industrial and agricultural enterprises are being involved, a special microclimate, which, perhaps, is completely different than at the Siberian Department, but just as favorable, is emerging, because everything lives on vital needs and real problems.

[Question] Apparently, having begun to speak about this, you have approached the third direction of restructuring—in the area of the coordination of scientific activity. What is the main goal here?

[Answer] The departments as scientific and scientific organizational centers of the academy should become the basic unit in the coordinating activity of the USSR Academy of Sciences. The academy should coordinate all academic science with VUZ and sectorial science on the basis of all-union programs in the most important directions of science.

Now a very undesirable trend—a certain isolation of the activity of several republic academies from the activity of the USSR Academy of Sciences—has clearly appeared in this area. At one time, when the academies of sciences of the republics were weak, they sent quite a large number of specialists to graduate studies and doctoral studies of leading academic institutions of the country. Owing to this about 10-20 years ago scientific schools, which have been recognized throughout the world, appeared in many republics. But gradually the academies of sciences grew stronger and formed their own institutions and structures after the pattern of central ones, and at some moment several of them became reserved. The reproduction of candidates and doctors of sciences primarily or entirely locally began, and hence the noted isolation from the common tasks of the development of basic research in the country.

Now we see that, when the academies of sciences of the union republics had grown vigorously, the USSR Academy of Sciences did not find new forms of fruitful cooperation with them. In turn, the republic academies did not display initiative in the exchange of specialists, preferring to develop themselves their own science. It is necessary to see to it that at each republic academy there would be a small number of scientific institutions, about which the entire world would know, the others should provide food for VUZ and sectorial science. Such a situation has formed at several academies—the Ukrainian, Belorussian, Armenian, and several others. They have their own nature in science, their research, as a rule, is of the highest world level.

[Question] The last of the directions of restructuring, which were named by you, is personnel policy.

[Answer] This has for a long time been an urgent problem, but everything does not reduce to it. As a whole it is a question of the proper combination of young and mature scientists, the objective evaluation of the results of scientific activity, and the corresponding stimulation of every worker.

The continuous renewal of the personnel of an institute should become the most important principle. The analysis shows that at the institutes of the Academy of Sciences 4-5 percent of the personnel change naturally: retirement on a pension, transfer to another job, and so on. The mechanism of the annual renewal of the personnel of the academic scientific institution, which is being proposed by the presidium, apparently requires annual renewal on the average by 5 percent.

[Question] Five percent a year? Hence, in 20 years will the staff of the institute be completely replaced? And in general, will no people over 45 remain at it?

[Answer] On the average, this is only on the average. Somebody will leave in 5 years, somebody will work 30 years. No intelligent manager is interested in the mechanical departure from work of middle-age people—nowhere can one manage without their wisdom. But in science the individual approach and the consideration of the personal creative potential are especially important. I am not yet saying that the loss of the enormous scientific, life, and moral experience of the older generation of the academy, which links generations of scientists, is intolerable for the development of science.

A flexible, informal approach to the personnel policy of the USSR Academy of Sciences is a mandatory condition of the restructuring of our work and the changeover of science to the intensive path of development.

Here it must be borne in mind that the USSR Academy of Sciences and the academies of sciences of the union republics are structurally quite conservative organizations. Conservatism has penetrated deep and has become firmly established, and now we are becoming the slaves of the structures and traditions (including negative ones), which accumulated for decades. The primary danger is the ossification of organizational forms at institutes. But the attempts of young people to break out

of the rigid framework at times end simply with dismissal from the institute. As a rule, the manager of a division blocks the transfer of his staff member to another division or research collective. This for some reason is considered an unethical, even disgraceful act.

Meanwhile the entire world has changed over to flexible collectives and to the competitive solution of arising scientific problems. A new collective, to which specialists from outside can also be attracted, is quickly formed from the staff of the institute. At our institutions such mobility does not yet exist, but we should make this possible and create for people the conditions for the complete revelation of the creative potential of each person and the collective as a whole.

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Changes in Science Due to New Economic Mechanism

18140137 Moscow SOTSIALISTICHESKAYA INDUSTRIYA inRussian11 Dec 87p 2

[Interview with Deputy Chairman of the USSR State Committee for Science and Technology I. Bortnik by D. Pipko under the rubric "Restructuring: Practice and Problems": "The Commodity Is New Developments. Learn Cost Accounting"; date, place, and occasion not given; first three paragraphs are SOTSIALISTICHESKAYA INDUSTRIYA introduction]

[Text] "Why, now for every trifle science will begin to fleece us threefold," the directors of enterprises assert.

"We will have to dismiss nearly half of the staff members—enterprises now have no time for science," the managers of scientific research institutes worry. These are far from the most categorical of the opinions which are being encountered on the threshold of an important event: with the new year science is beginning "to count money"—it is changing over to full cost accounting and self-financing. In other words, the mechanism of the activity of our scientific research institutes, design bureaus, and scientific production associations is changing radically. It is clear that a large number of controversial and painful questions are arising for the people, who work at them, and for their business partners.

Today I. Bortnik, deputy chairman of the USSR State Committee for Science and Technology, answers several of them:

[Answer] Today there cannot be two opinions: in order to accelerate the development of the economy, it is necessary to stimulate science and to use its potential more completely. The decree "On the Changeover of Scientific Organizations to Full Cost Accounting and Self-Financing," which was adopted by the CPSU Central Committee and the USSR Council of Ministers, is also aimed at the accomplishment of this task. During its preparation it was a question, in particular, of freeing our scientific research institutes, design bureaus, and scientific production associations as much as possible from the inflexible methods of administration by mere decree—they are simply destructive for science.

On the other hand, the adopted Law on the State Enterprise forced industry to begin thinking in categories of self-financing, self-support [samookupayemost], and independence. For scientific organizations these categories still remained abstract. It was necessary not simply to eliminate this "gap," but also to lay a firm foundation for the interaction of science and production. Hence, too, the key line of the decree was specified: to change the management of science over to economic means. And through the economy to link it with industry.

There was nothing unexpected in such a statement of the question. However, now it is already evident that the sphere of science—from rank and file staff members to managers—was poorly prepared for this. Among the large number of reasons two appeared most distinctly. The first consists in the fact that the economic training of the management personnel of science of all levels (I can also say this about myself) and the collectives of scientific organizations was obviously inadequate for work under the new conditions. Given the same short time, which we have, this shortcoming made the process of the changeover of scientific research institutes to cost accounting an extremely urgent one and one that often occurs painfully.

On the other hand, previously new demands, instructions, and indicators accompanied such decrees. But here there is nothing. Just the basic principles. And several standards, which the ministries themselves should have established for the scientific research institutes. Therefore, initially a barrage of questions fell upon the staff members of our committee. And then also entreaties: introduce some methods, recommendations, restrictions. One could feel that people were not accustomed to the fact that they are being entrusted to solve crucial problems independently. This psychological barrier, in my opinion, is the main obstacle today.

[Question] Which of the ideas of the new mechanism leads to radical changes in the activity of science? For were research and development also performed previously not for nothing?

[Answer] Now research results, design, technological, and planning developments, evaluation, and other services, finished models or batches of items, sets of design and technological documentation, various types of assistance in case of the introduction of developments—all this output of scientific organizations is now becoming a commodity. It is created on the basis of contracts with clients, in which the price is immediately stipulated. Less the expenditures it also gives science a profit, which is distributed in the following manner.

Among the mentioned few standards, which will now begin to operate in science, the first specifies the deductions to the budget: they will be within the range of 2-10 percent of the profit. Moreover, scientific organizations should make payment to the budget for their own fixed capital in the amount of 1-2 percent of its value. And for manpower resources—200-300 rubles per staff member annually. Deductions for the centralized funds of ministries are also envisaged, but for the present transitional stage they, as a rule, have been established at the zero level.

The idea of each of these standards is traced without difficulty. For example, why should every institute have its own powerful computer, if it is less expensive to invest money in a collective-use computer center and to turn as needed to its services? Although, of course, there is also the danger that scientific organizations in the heat of "saving" or under the threat of bankruptcy will also begin to get rid of necessary equipment. Another matter is the fee for manpower resources: it should insure scientific research institutes themselves against attempts to inflate the staffs.

The balance of the profit, which forms after all these payments, is at the disposal of the scientific organization. And it is used for the formation of the material stimulation fund and the fund of scientific, technical, and social development. A standard of currency deductions in favor of institutes is also envisaged. In short, the well-being of scientific research institutes is now entirely in their own hands—earn!

Today the main problem, which is causing numerous disputes and complications, also arises here. Often they are valid ones, but at times also far-fetched ones. Previously in the estimate of the expenses of the scientific organization only its, as is customary to say, own expenses—the wage, materials, equipment, expenditures on the production of test output—were shown. Many expenses were not included in the estimate, but were financed for the most part from centralized sources. Thus the questions with housing, new construction, and retooling were settled. Now the "secret" has as if become the "obvious"—these expenditures must be taken into account when determining the value of the scientific commodity. And the money for them must be earned.

[Question] But where is one to get this money? Calculations show that with allowance made for all the expenditures the cost of developments of scientific organizations will increase by approximately 1.5-fold. Who should pay for this increase? Enterprises? But why?

[Answer] Correct: today they should not. But here it should be said that the indicators of the "profitability," which are incorporated by scientific organizations in the calculations, should not at all be "materialized" without fail when establishing with the client the contract price for the scientific commodity. It is no secret that the centralized financing of scientific organizations previously often placed them in a better material position than the plants, for which they should have worked. Now their material position is linked.

At the same time it is necessary to remember that we are carrying out the changeover of scientific organizations to self-financing and self-support [samookupayemost] under the conditions of the established assignments of the five-year plan. In other words, the present stage is of a transitional nature—the identification of the real expenditures and the real sources of their covering is taking place, the obvious direct ties between those, who bear the expenditures, and those, who cover them, are being traced.

Nevertheless all the sources for covering the expenditures for the most part already exist in the sectors. Merely their precise readdressing is required. It is not easy, but it is necessary to do this. And with respect to that portion of the expenditures (the fee for resources and capital), which has appeared for the first time and for which there were no sources of covering at the disposal of ministries, the USSR State Planning Committee, the State Committee for Science and Technology, and the USSR Ministry of Finance adopted decisions which make it possible during the current five-year plan to manage with the already available resources.

The process of "identification" is difficult. It turns out that many scientific organizations do not enjoy prestige among those who previously paid indirectly for their existence. It is becoming clear that whoever used the results of science often did not think about what they cost in reality. He used the fruits of its work as a free addition to his own profit. It is no secret that now, too, many enterprises do not understand the need to finance work for the future.

[Question] But does not this means lead to a focus on petty topics? Will institutes suddenly begin to strive for a larger number of simple jobs, which it is possible to complete in a short time? Or for which the client is ready to pay more than others? Who, then, will solve the difficult problems which are connected with the future of the development of sectors and our entire economy?

[Answer] It may lead to a focus on petty topics, but it is necessary to combat this. Here who is who, the maturity of both scientific organizations and industrial enterprises, and the level of thinking of collectives and their managers will also be identified. But a certain insurance buffer will be retained: ministries will have centralized funds in a significant amount (in my opinion, even in an unjustifiably large amount). Their basic purpose is the financing through state orders of research work, the most important stages of state scientific and technical goal programs, sectorwide programs, the assignments of interbranch scientific technical complexes, and work within the framework of the Comprehensive Program of

Scientific and Technical Progress of the CEMA Countries. Analyses show that in the centralized funds of ministries there are enough assets for this work....

We are often asked: Will scientific organizations not be left without contracts and without money? The first experience of the entry of institutes into contractual relations with plants testifies that a problem exists here.

Here it is a question not of the whims or conservatism of production workers, but of the conditions, under which they have been placed. Let us assume, for example, that the average efficiency of research and development in our country comes to 3 rubles per ruble of expenditures. This means that, having invested a ruble in science, the enterprise will derive 3 rubles of profit. Is it not rather good? It all depends. If the standard of deductions for its own funds are established for it within the range of 20 percent, from the 3 rubles the enterprise will get only 60 kopecks. In other words, every ruble, which has been invested in science, will bring it a loss of 40 kopecks.

Is it a hopeless situation? By no means. Apparently, either it is necessary to leave to enterprises a larger share (for example, 70 percent) of the profit earned by them (at any rate, if only that portion of it, which was earned in cooperation with science). Or the ministry, which took this profit for the centralized fund, should share with the enterprise for the purpose of financing science. On their part, in order not to be without contracts, scientific research institutes should constantly increase the effectiveness of their developments. But there are also situations, when the greatest efficiency does not guarantee the conclusion of a contract. For example, if an institute demands 100,000 for a development, but the enterprise has only 90,000, they will hardly come immediately to an agreement. Here the production workers are left with a real way out: they have the right to announce competition for a less expensive version of the solution of the problem. While scientists may end up in a desperate situation, which forces them to agree to losses in order not to lose everything. So the fears that science will begin to "strip" production for the present are without grounds....

[Question] But what if I, being the director of an enterprise, were to force an institute to agree to concessions? But then it turns out that its development yields a much greater impact, but I refuse to share the profit with the scientists. What would you say in this regard?

[Answer] I would congratulate you on the happy purchase. While I would remind scientists that under the conditions of cost accounting only the contract stipulates the interrelations of the scientific organization and the client. Only it specifies precisely what is the "scientific commodity" that is to be paid for. The amount of this payment—the contract price—is also stipulated in it. Whether the institute will help the client in the introduction of the development, while the client will help the scientific research institute in the establishment of pilot-scale plants, whether the production workers agree to share the above-planned profit with scientists, and what sanctions are envisaged for the violation of some points or others of the agreement—all this should be indicated in the contract.

So that these and many other questions would not slip from view, the State Committee for Science and Technology drafted, coordinated, and approved the Statute on Contracts for the Development (Transfer) of the Scientific and Technical Product. But, despite this, the democratic nature of the procedure of the conclusion of contracts and the establishment of the contract price is realized with difficulty by many people. Some are afraid of selling too cheap, others are afraid of paying way too much. But together they want to return to the times, when it was not necessary to think, argue, and prove—the methods of calculation settled everything. We are confident that only a joint dialog can lead the client and the developers to a mutually advantageous agreement....

[Question] Time no longer remains for disputes: as of 1 January scientific organizations should change over to the new path. Will they have time?

[Answer] With respect to the basic items they should have time. Ministries have already drafted the standards that were named earlier and have reported them to their institutes, design bureaus, and scientific production associations. With allowance made for the requirements of cost accounting the conclusion again of contracts is under way, adjustments are being made in the plans of scientific research institutes: in pursuing a profit it is necessary not to pass over research that promises a reserve for tomorrow. But man remains the main, decisive unit of the begun restructuring. Science is obliged precisely to his talent, boldness of ideas, and persistence both for outstanding discoveries and for promising developments. It is necessary to provide precisely him with an understanding of cost accounting, which creates the conditions for creative research....

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Nikolay Mikhaylovich Zhavoronkov
18140148a Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 12, Dec 87 pp 112-113

[Article under the rubric "News Items and Information": "Academician N.M. Zhavoronkov Is 80 Years Old"]

[Text] Academician Nikolay Mikhaylovich Zhavoronkov, Hero of Socialist Labor and twice winner of the USSR State Prize, is the recognized head of the Soviet school of chemical technologists. He has performed in-depth scientific research in the field of the chemistry and technology of fixed nitrogen and has studied and improved the most important processes of the production of synthetic ammonia and nitric acid. The scientist and his associates made a large contribution to the chemistry and technology of stable isotopes of light elements: they developed and implemented in industry methods of obtaining heavy isotopes of nitrogen and oxygen of high concentration, as well as methods of the separation of compound mixtures and the fine purification of substances.

N.M. Zhavoronkov is devoting much attention to the development of the theoretical principles of chemical technology and to the methods of the intensification of technological processes. Under his supervision fundamental research on the hydrodynamics and mass and heat transfer in packed and film columns was conducted, and the multistage methods of the separation and dissolving of solid substances in turbulent flows were also developed and improved.

In recent years N.M. Zhavoronkov has been actively participating in the development of research in the field of ceramic and composite materials and reinforcing fibers for the national economy and new fields of technology.

For many decades N.M. Zhavoronkov headed scientific and educational collectives, participating in the solution of important state problems. At present he is director of the Institute of General and Inorganic Chemistry imeni N.S. Kurnakov of the USSR Academy of Sciences, academician secretary of the Physical Chemistry and Technology of Inorganic Materials Department, a member of the Presidium of the USSR Academy of Sciences, a member of the USSR State Committee for Science and Technology, and a member of the Committee for Lenin and State Prizes.

N.M. Zhavoronkov was a delegate of the 21st CPSU Congress and was elected a deputy of the Moscow Soviet of six convocations. For many decades he has been a member of the board of the All-Union Chemical Society imeni D.I. Mendeleyev and the Society for Knowledge and a member of the All-Union Council of Scientific and Technical Societies of the All-Union Central Council of Trade Unions.

The fruitful scientific, pedagogical, and public activity of the scientist has received extensive recognition in our country and abroad: he was elected an honorary doctor of higher educational institutions of Hungary, France, and the CSSR, an honorary academician of the Hungarian and GDR academies of sciences, and a foreign member of the CSSR and Polish academies of sciences.

In connection with the celebration the Czechoslovak Academy of Sciences awarded N.M. Zhavoronkov the highest award—the Gold Medal for Services to Science and Mankind.

The Presidium of the USSR Academy of Sciences sent the celebrator a salutatory address, in which his scientific services were commended and wishes of good health, happiness, and great creative successes were expressed.

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Oleg Timofeyevich Bogomolov
18140148b Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 12, Dec 87 pp 113-114

[Article under the rubric "News Items and Information": "Academician O.T. Bogomolov Is 60 Years Old"]

[Text] For services in the development of economic science and in the training of scientists and in connection with his 60th birthday Academician Oleg Timofeyevich Bogomolov by the Ukase of the Presidium of the USSR Supreme Soviet of 19 August 1987 was awarded the Order of Labor Red Banner.

The scientific community knows O.T. Bogomolov was an outstanding economics scholar and the author of numerous studies on theoretical and methodological problems of the development of the world socialist system, the political economy of socialism, the theory of the international division of labor and socialist integration, and the world economy. He has written and published a number of monographs, including "Teoriya i metodologiya mezhdunarodnogo razdeleniya truda" [The Theory and Methodology of the International Division of Labor], "Strany sotsializma v mezhdunarodnom razdelenii truda" [The Socialist Countries in the International Division of Labor], and others. The works of the scientist are well known in our country and abroad. A portion of his monographs have been translated in socialist and capitalist countries.

O.T. Bogomolov is combining much scientific research work with participation in the practical implementation of foreign economic and foreign policy measures of the Soviet state.

In the position of director of the Institute of Economics of the World Socialist System of the USSR Academy of Sciences O.T. Bogomolov has shown himself to be a talented organizer of science. He heads the Problem Commission of Multilateral Scientific Cooperation of the Academies of Sciences of the Socialist Countries "The World Socialist System" and the Scientific Council of the USSR Academy of Sciences for the Complex Problem "The World Socialist System" and is editor in chief of the journal IZVESTIYA AKADEMII NAUK SSSR, SERIYA EKONOMICHESKAYA.

The scientist is performing much public political work as a member of the executive committee of the International Economics Association, a member of the board and chairman of an international commission of the Society for Knowledge, and deputy chairman of the Soviet Committee for European Security and Cooperation. He was been elected a foreign member of the Bulgarian Academy of Sciences and an honorary member of Karl Marx University in Budapest.

The Presidium of the USSR Academy of Sciences sent the celebrator a salutatory address, in which, having commended his scientific services, it wished him good health, long years of life, and new creative achievements.

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Nikita Nikolayevich Moiseyev
18140148c Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 12, Dec 87 pp 114-115

[Article under the rubric "News Items and Information": "Academician N.N. Moiseyev Is 70 Years Old"]

[Text] For services in the development of science and the training of scientists and in connection with his 70th birthday Academician Nikita Nikolayevich Moiseyev by the Ukase of the Presidium of the USSR Supreme Soviet of 22 August 1987 was awarded the Order of Lenin.

USSR State Prize Winner N.N. Moiseyev is an outstanding scientist in the field of mechanics, applied mathematics, and control theory and a prominent organizer and popularizer of science. His classical works on the dynamics of a body in a fluid were of not only theoretical, but also great applied importance. Having used the methods of asymptotic analysis, he developed analytical and numerical methods of studying the trajectories of spacecraft and rockets. Work on the automation of the designing of complex technical systems, which was based on the principles of systems analysis, was begun on his initiative and under his supervision. A number of computer-aided design systems of various objects, which were developed on the basis of his ideas, are operating successfully at present. For works on these themes he was awarded a prize of the USSR Council of Ministers.

The works of N.N. Moiseyev on the modeling of the biosphere had broad international repercussions. His ideas in this field contributed to the emergence of a new direction of basic science; in particular, a set of models, which made it possible to evaluate the climatic consequences of nuclear war, was developed. General methodological questions of the use of computer technology in natural science research and in the control of the processes of social development hold a significant place in his scientific activity. He has written on these questions scientific monographs, popular science books, and articles, which have brought him deserved fame in the broadest strata of Soviet society and abroad.

His works on the use of the methods of information science in the accomplishment of the tasks facing agriculture were of great importance. He was elected a full member of the All-Union Academy of Agricultural Sciences imeni V.I. Lenin.

N.N. Moiseyev is successfully combining scientific work with fruitful activity on the training of scientists at the USSR Academy of Sciences and at the largest Moscow educational institutions: the Moscow Physical Technical Institute, Moscow State University imeni M.V. Lomonosov, and the Academy of the National Economy attached to the USSR Council of Ministers. A number of textbooks have been written on the basis of courses which he has given.

He displayed his organizing abilities first of all at the Computer Center of the USSR Academy of Sciences, where for 30 years he has headed a scientific division and for 20 years was deputy director. The scientific services of N.N. Moiseyev and his organizing activity have brought him international recognition. He is a full member of the International Academy of Astronautics and heads the USSR National Committee in the International Federation of Operations Research Societies. All his basic works have been translated into foreign languages and have been published abroad.

In the salutatory address, which was sent to the celebrator, the Presidium of the USSR Academy of Sciences wished him health, happiness, and new creative successes.

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Tatyana Ivanovna Zaslavskaya
18140148d Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 12, Dec 87 p 115

[Article under the rubric "New Items and Information": "The Celebration of Academician T.I. Zaslavskaya"]

[Text] For services in the development of economic science and the training of scientists the Presidium of the USSR Supreme Soviet by the Ukase of 8 September 1987 awarded Academician Tatyana Ivanovna Zaslavskaya the Order of the October Revolution.

The scientific community knows T.I. Zaslavskaya as an outstanding economics scholar in the field of the economics and sociology of labor, the permanent supervisor of studies of the social problems of the development of the national economy of Siberia, and the author of more than 150 scientific works, which are devoted to the study of the problems of the socioeconomic development of the agrarian sector of the USSR and the social mechanisms of the functioning of our society. These works are well known in our country and abroad. At present T.I. Zaslavskaya is busy with the development of a new scientific direction—economic sociology.

Such basic studies as "Migratsiya selskogo naseleniya" [The Migration of the Rural Population], "Razvitiye selskikh poseleniy" [The Development of Rural Settlements], "Metodologiya i metodika izucheniya sovremennoy derevni" [The Methodology and Methods of Studying the Modern Village], "Sotsialno-demograficheskoye razvitiye sela (regionalnyy analiz)" [The Sociodemographic Development of the Countryside (A Regional Analysis)], and others were published under her supervision.

She is combining fruitful scientific work with scientific organizational activity. The large scientific collective, which was formed under her supervision, is successfully working on the social problems of the development of the Soviet economy. Her activity in the position of president of the Soviet Sociological Association, including its Siberian Department, is well known. She is working fruitfully on various scientific councils and on the editorial boards of three journals. The establishment of the journal IZVESTIYA SIBIRSKOGO OTDELENIYA AN SSSR. SERIYA EKONOMIKI I PRIKLADNOY SOTSIOLOGII, of which she is editor in chief, was of great importance for the development of sociological science.

T.I. Zaslavskaya is devoting much effort and time to the training of scientists and is performing active teaching work at Novosibirsk State University. Doctors and candidates of sciences are among her numerous students.

She is performing much public political work as a member of the Society for Knowledge and the Committee of Soviet Women. Her activity received a high rating of the party and government. She has been awarded lofty state awards—the Orders of Labor Red Banner and Friendship of People and medals.

The Presidium of the USSR Academy of Sciences in the salutatory address wished the celebrator good health, long years of life, and new creative achievements.

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Georgiy Konstantinovich Skryabin

18140148e Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 12, Dec 87 p 116

[Article under the rubric "News Items and Information": "Academician G.K. Skryabin Is 70 Years Old"]

[Text] For services in the development of biological science and the training of scientists and in connection with his 70th birthday Academician Georgiy Konstantinovich Skryabin by the Ukase of the Presidium of the USSR Supreme Soviet of 16 September 1987 was awarded the Order of Labor Red Banner.

A most prominent microbiology scholar, a Hero of Socialist Labor, and USSR State Prize winner, Academician G.K. Skryabin achieved outstanding gains in the study of the biochemical activity of microorganisms and the possibilities of their practical use. With his direct participation highly productive cultures were obtained, regulations were formulated, and the microbiological synthesis of yeast protein based on hydrocarbons was introduced. The industry of the large-tonnage production of protein-vitamin concentrates was established on this basis.

G.K. Skryabin obtained substantial results in the study of the role of microorganisms in the processes of the involvement in the carbon cycle of xenobiotics—compounds which are foreign to the natural environment. On the basis of the example of the breakdown of herbicides, heterocyclic bases, and pesticides he showed the involvement of microbes in their decomposition and studied the means of metabolism and the peculiarities of the behavior of these compounds. He developed principles of the evaluation of new pesticides.

G.K. Skryabin is intensively developing a new section of modern science—the molecular biology and molecular genetics of microorganisms, the development of which he is creatively combining with environmental protection, and is studying the possibilities of the genetic control of the processes, the transformation, and the biodegradation of organic compounds. As a result of the work performed under his supervision the extensive prevalence in nature of plasmids, which control the oxidation of naphthalene, derivatives of the benzene series, petroleum, and petroleum products, was shown and new useful forms of microorganisms are being engineered.

The development of the theory and methods of the microbiological transformation of steroid compounds and the commercial obtaining of cortisone, hydrocortisone, prednisolone, and prednisone is the most important result of the activity of G.K. Skryabin. He developed and introduced in production processes of the microbiological obtaining of the antibiotic grizin, betakartin, and gibberellin.

G.K. Skryabin is successfully combining fruitful scientific activity with vast scientific organizational and public work in the positions of deputy of the RSFSR Supreme Soviet, a member of the Moscow City Committee of the CPSU, chief scientific secretary of the Presidium of the USSR Academy of Sciences, director of the Institute of Biochemistry and Physiology of Microorganisms of the USSR Academy of Sciences, president of the All-Union Microbiological Society, chairman of the Scientific Council of the USSR Academy of Sciences for the Problem "Microbiology," and editor in chief of the journal NAUKA V SSSR. G.K. Skryabin enjoys the deserved respect of the international scientific community, to which his election as honorary member of 12 foreign academies testifies.

In the salutatory address sent to the celebrator the Presidium of the USSR Academy of Sciences wished him good health, happiness in his personal life, and new successes for the good of Soviet science.

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Valeriy Petrovich Chichkanov
18140148f Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 12, Dec 87 p 117

[Article under the rubric "News Items and Information": "Corresponding Member of the USSR Academy of Sciences V.P. Chichkanov Is 50 Years Old"]

[Text] For services in the development of economic science and the training of scientists and in connection with his 50th birthday Corresponding Member of the USSR Academy of Sciences Valeriy Petrovich Chichkanov by the Ukase of the Presidium of the USSR Supreme Soviet of 25 July 1987 was awarded the Badge of Honor.

The scientific community knows V.P. Chichkanov as a prominent economics scholar and the author of 150 scientific works, which are well known both in our country and abroad. His research on the problems of regional economics, long-range planning and forecasting, and the improvement of the organization of labor, production, and manager is of great theoretical and practical importance for the increase of the efficiency of social production.

Such works as "Proizvoditelnost truda: teoriya i metodologiya" [Labor Productivity: Theory and Methodology], "Printsipy i metody dolgosrochnogo planirovaniya ekonomiki regiona" [The Principles and Methods of the Long-Range Planning of the Economy of a Region], "Sotsialno-ekonomicheskiye problemy povysheniya effektivnosti obshchestvennogo truda" [Socioeconomic Problems of the Increase of the Efficiency of National Labor], "Analiz i prognozirovaniye ekonomiki regiona" [The Analysis and Forecasting of the Economy of a Region], and others were written by the scientist.

V.P. Chichkanov is devoting much attention to the training of scientists. More than 25 candidates of sciences have been trained under his supervision.

The scientist is successfully combining scientific and pedagogical activity with fruitful scientific organizational work. He is director of the Institute of Economics of the Ural Department of the USSR Academy of Sciences.

In the salutatory address the Presidium of the USSR Academy of Sciences wished the celebrator good health, long years of life, and new creative successes.

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Awards in Azerbaijan
18140168 Baku BAKINSKIY RABOCHIY in Russian 15 Dec 87 p 2

[Article by Azerinform: "Awards in Azerbaijan"]

[Text] By an edict of the Presidum of the Azerbaijan SSR Supreme Soviet, Gasan Ali Rzaogly Aliev, member of the Azerbaijan SSR Academy of Sciences was awarded honors from the AzSSR Supreme Soviet for many years of fruitful scientific activity, efforts in training scientific cadre and to commemorate his 80th birthday.

By an edict of the Presidum of the Azerbaijan SSR Supreme Soviet, Khudu Surkhay Mamedov, Laboratory Chief at the Institute for Inorganic and Physical Chemistry, AzSSR Academy of Sciences and a correspondent member of the Azerbaijan SSR Academy of Sciences was awarded honors from the AzSSR Supreme Soviet for many years of fruitful scientific activity, efforts in training scientific cadre and to commemorate his 60th birthday.

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